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**Technical Provisions – Divisions 11 through 14**

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**U.S. ARMY ENGINEER DISTRICT, SAVANNAH  
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SECURITY VAULT DOOR AND PREFABRICATED MODULAR VAULT SYSTEM

**12/97**

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CEGS-11020 (December 1997)

## SECTION 11020

SECURITY VAULT DOOR AND PREFABRICATED MODULAR VAULT SYSTEM  
**12/97**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## FEDERAL SPECIFICATIONS (FS)

FS AA-D-00600 (Rev B) Door, Vault, Security

## UNDERWRITERS LABORATORIES (UL)

UL 608 (1999) Burglary Resistant Vault Doors and Modular Panels

## 1.2 GENERAL REQUIREMENTS

The vault door unit shall be a steel security-vault type door with frame, day gate, and ramp type threshold, and shall be a standard product of a manufacturer specializing in this type of fabrication. Modular vault system shall consist of UL class M modular vault panels designed to accept a Class 5 security vault door. Vault shall be five-sided system attached to structural slab.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Security Vault Door; FIO.

Manufacturer's catalog data including catalog cuts and brochures. The data shall show that the proposed vault door unit conforms with the requirements in FS AA-D-00600, and has been tested and approved by the General Services Administration (GSA).

Modular Vault System; FIO.

Manufacturer's catalog data including catalog cuts and brochures. The data shall show that the proposed vault system unit conforms with the requirements of UL 608.

SD-13 Certificates

Security Vault Door; FIO.

Certification shall state that vault-door units that do not bear the GSA label are constructed to Class 5 standards.

Modular Vault System; FIO.

Certification shall state that vault panels are constructed to meet UL 608 for torch and tool attack resistance.

#### 1.4 DELIVERY AND STORAGE

Door and frame assemblies and vault panels shall be delivered to the jobsite in a protective covering with the brand and name clearly marked thereon. Materials delivered to the jobsite shall be inspected for damage, and unloaded with a minimum of handling. Storage shall be in a dry location with adequate ventilation, free from dust, water, and other contaminants, and which permits easy access for inspection and handling. Items shall be stored off the floor on nonabsorptive strips or wood platforms. Damage to doors, frames and vault panels shall be prevented during handling. Damaged items that cannot be restored to like-new condition shall be replaced.

### PART 2 PRODUCTS

#### 2.1 VAULT DOOR AND FRAME

Design and construction of the door and frame assembly shall conform to FS AA-D-00600. The door shall be Class 5, Type IIR - right opening swing without optical device or IIL - left opening swing without optical device, as shown on drawings, Style K - key change combination lock. Locks for arms room vault doors shall be UL listed Group 1 or 1R combination locks.

#### 2.2 DAY GATE

The day gate shall be the manufacturer's standard product designed for use with the vault door furnished, and shall provide access control. The gate shall be hinged on the same side as the vault door, shall swing into the vault, and shall have a locking device operable from outside by key and from inside by knob or handle.

#### 2.3 MODULAR VAULT SYSTEM

Vault panels shall be constructed of laminated or high security reinforced modular concrete panels. Panels shall be designed for butt and weld joint connections and form side walls and ceiling. Panel sizes shall be modular with makeup panels at ends as required to achieve vault size indicated on drawings. Vault shall be interfaced with building's HVAC, fire protection, lighting and communications systems.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

The vault door assembly shall be installed in strict compliance with the printed instructions and drawings provided by the manufacturer. The day gate shall be installed in a manner that will not interfere with operation of the release handle on the inside of the vault door. After installation,

the door, the locking mechanism, and the inner escape device shall be adjusted for proper operation. Steel shoe plate or angle iron shall be furnished by vault manufacturer for attachment to floor about vault perimeter. Set vault panels on plate or angle iron and weld as recommended by manufacturer.

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LOADING DOCK LEVELER

**11/88**

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CEGS-11162 (November 1988)

## SECTION 11162

## LOADING DOCK LEVELER

**11/88**

## PART 1 GENERAL

## 1.1 GENERAL REQUIREMENTS

## 1.1.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

## 1.1.2 Nameplates

As a minimum, each loading dock leveler shall have the manufacturer's name, address, type or style, model or serial number, rated capacity, and catalog number on a plate secured to the equipment.

## 1.1.3 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-01 Data

Loading Dock Levelers; FIO.

Data shall include a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions.

## SD-04 Drawings

Loading Dock Levelers; GA|F.

Drawings shall contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Detail drawings shall show proposed layout and anchorage of equipment and appurtenances. Detail drawings shall show the concrete pit details including flush edge angles, dock bumpers, and sloped pit bottom; method of mounting and anchoring; and location of

control stations and disconnect switches. For vertical, edge-of-dock, and free-standing board dock levelers, drawings shall show details of required building construction and dock bumpers and structural shapes installation, in lieu of concrete pit details.

#### SD-19 Operation and Maintenance Manuals

##### Loading Dock Levelers; FIO.

Six copies of operation and six copies of maintenance manuals shall be provided for the equipment furnished. One complete set shall be furnished prior to performance testing and the remainder shall be furnished upon acceptance. Operating manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operating manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed. After approval of the detail drawings, and not later than 2 months prior to the date of beneficial occupancy, spare parts data for each different item of material and equipment specified are required. The data shall include a complete list of parts and supplies, with current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 year(s) of service.

### 1.3 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust, or other contaminants.

## PART 2 PRODUCTS

### 2.1 LOADING DOCK LEVELERS

Loading dock levelers shall be permanent type, and shall have minimum dynamic loading capacity of 9070 kg. When not in use and in the cross traffic position, loading dock leveler area shall be level with the surrounding loading area.

#### 2.1.1 Type

Loading dock leveler shall be electrohydraulic type with electric motor and hydraulic pump operating a hydraulic cylinder that adjusts dock leveler board position. A truck restraint system shall be coordinated with the dock leveler to lock truck or trailer into position during loading and for overnight security. A visual signal shall be incorporated to inform dock operator and driver of locked or unlocked status.

#### 2.1.2 Operating Range

The outer end of each loading dock leveler shall be adjustable in height, providing a board whose incline can be adjusted to suit the height of truck and trailer beds. Each board end shall have a minimum of 610 mm of vertical adjustment. Height adjustments shall be divided 305 mm above and 305 mm below the dock level to provide coverage between 914 mm (36 inches) and 1524 mm (60 inches) above grade.



### 2.1.3 Lip Extension

Each loading dock leveler shall include provisions so that its end lip may be extended from a retracted position to an extended position beyond the forward edge of the platform bumpers to rest on the bed of a truck or trailer not less than 406 mm (16 inches). Lip extension shall be 406 mm (16 inches).

### 2.1.4 Tilt Allowance

Each loading dock leveler shall provide automatic compensation, with board loaded, for out-of-level truck bed condition (difference in elevation from side to side at the rear of the truck bed) of up to 102 mm (4 inches) over the width of the board.

### 2.1.5 Load Compensation

Each loading dock leveler shall be constructed to provide automatic compensation (automatic float), with board loaded or unloaded, for the loading and unloading of the motor vehicle. When the end lip is extended so as to rest on the bed of a truck or trailer, the end lip shall automatically adjust up or down with the movement of the truck or trailer bed resulting from the compression of the truck or trailer springs.

### 2.1.6 Automatic Safety Device

#### 2.1.6.1 Omitted

#### 2.1.6.2 Electrohydraulic

A hydraulic check valve shall be provided to prevent a drop of more than 76 mm (3 inches) at the outer end of the board should the truck or trailer be moved away leaving the board unsupported. This safety device shall be effective with any load on the board up to the fully dynamic rated capacity of the loading dock leveler.

### 2.1.7 Dimensions

The live load carrying surface of the leveler shall be nominal 1.85 meters (6 feet) wide and 1.85 meters (6 feet) long with end lip retracted.

### 2.1.8 Motor

Each electrohydraulic loading dock leveler shall be equipped with a totally enclosed fan cooled (TEFC) squirrel cage induction electric motor, three phase, 208 volts, 60 Hz, which shall not exceed its rated capacity under full load conditions of loading dock leveler.

### 2.1.9 Controls

Each electrohydraulic loading dock leveler shall be equipped with a power unit installed under the leveler proper as an integral part of the loading dock leveler. Each loading dock leveler shall be controlled by a heavy duty push button station located as shown with an "UP" or "RAISE" button. [Dual controls, shall be provided.] To prevent accidental operation and damage, each button shall be recessed in its station or protected by a projected peripheral collar. Station push button shall be indelibly identified by means of cast or etched letters on the station. Push button

station shall be of rugged design and positive in operation; no less than NEMA Type 4 enclosure shall be furnished. Buttons shall be constant pressure type so that operation will cease immediately on release of button. Electrical work shall conform to Section 16415 ELECTRICAL WORK, INTERIOR.

#### 2.1.10 Dock Bumpers

A minimum of two high-impact resistant molded rubber or laminated rubber dock bumpers shall be furnished with each loading dock leveler.

### 2.2 OPERATION

Continuous pressure on the operating button shall cause the outer end of the board to raise and thus permit the operator to adjust the board incline as required to suit the level of the bed of a particular truck or trailer. Control shall activate board automatically to raise to maximum height and lower to rest on truck or trailer bed. The operator may interrupt cycle to lower board to resting position when desired. End lip on board shall extend hydraulically, automatically during board operation or by separate control button on panel. Dock leveler shall automatically return to storage position when truck or trailer moves away. Operation shall also permit lowering of board below dock level without extending end lip.

### 2.3 CORROSION PROTECTION AND PAINTING

#### 2.3.1 Fasteners

Bolts, screws, nuts, and washers shall be coated with hot-dip zinc or cadmium or made of corrosion resistant metal.

#### 2.3.2 Ferrous Metal Surfaces

Ferrous metal surfaces, including coated ferrous and inaccessible ferrous surfaces, (but not including bearings, gear contact surfaces, parts protected by lubrication, or other surfaces not usually painted or coated) shall be cleaned, phosphate treated, and given coat of epoxy primer followed by coat of epoxy or other approved coatings. Total dry film thickness shall be not less than 0.254 mm (10 mils). Coatings shall be allowed to dry hard before shipment. Color of finish coats shall be medium gray or manufacturer's standard.

#### 2.3.3 Nonferrous Parts

Nonferrous parts shall be protected against corrosion as necessary.

#### 2.3.4 Dissimilar Metals

Dissimilar metals which may be subject to electrolysis upon contact shall be separated by electrolytically inactive material.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Installation shall be as indicated and in accordance with manufacturer's installation instructions. Loading dock leveler and accessories shall operate easily and perform reliably. Unsatisfactory operation shall result in correction adjustment, or reinstallation until satisfactory performance

and operation is achieved and installation is acceptable to the Contracting Officer.

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SECTION 11165

DOCK BUMPERS

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NASA-11165 (MARCH 1999)

SECTION 11165

DOCK BUMPERS

03/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123 (1992; Rev A) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM D 2000 (1996) Standard Classification System for Rubber Products in Automotive Applications

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittals," in sufficient detail to show full compliance with the specification:

SD-04 Drawings

Fabrication Drawings for Dock Bumpers; FIO.

Fabrication drawings for dock bumpers shall be in accordance with the paragraph entitled, "Dock Bumpers," of this section.

SD-04 Drawings

Installation Drawings; FIO

Installation drawings for dock bumpers shall show details of anchorage.

SD-13 Certificates

Certificates of Compliance; FIO.

Certificates of compliance shall be submitted for the following items showing conformance with the referenced standards contained in this section.

Fastening Materials  
Rubberized Fabric  
Steel Angles  
Hardware Items

SD-14 Samples

Fasteners; FIO. Connectors; FIO. Supporting Rods; FIO. Bolts; FIO. Nuts ; FIO. Dock Bumper; FIO. Rubber; FIO.

Contractor shall provide the following samples:

One each of Fasteners, Connectors, Supporting Rods, Bolts, Nuts, etc., individually tagged and identified for use and location

One typical loading dock bumper completely assembled with supporting rods, end angles, bolts, and nuts. (This may be the smallest size bumper required.)

One section of Dock Bumper 200 millimeter wide by full depth and height of bumper including one end angle with the opposite end exposed for inspection

Sample of Rubber for bumper

### 1.3 DESIGN AND GRADES OF MATERIAL

Design, material, fabrication, and assembly shall conform to approved drawings and samples, and the requirements specified.

## PART 2 PRODUCTS

### 2.1 DOCK BUMPERS

Bumpers shall be constructed of resilient, laminated, rubberized-fabric pads, assembled on steel frames. Rubberized fabric shall conform to ASTM D 2000. Material shall be punched to receive 20 millimeter supporting rods. Bumpers shall be 115 millimeter thick, stand out from the dock, and be closed with two structural steel angles under 6700 newton pressure.

Solid rubber pieces may be used instead of rubberized fabric. Solid rubber shall conform to ASTM D 2000, Grade 4AA612A13B13F17.

### 2.2 STEEL ANGLES

Angles shall be 80 by 65 by 6 millimeter steel welded to 20 millimeter rods at one end (head of rods exposed on face of angle leg) and closed with threaded rod ends and nuts at the other end. Quantity of rods required for each bumper shall be as indicated and in accordance with approved drawings. The 65 millimeter leg of the steel angle on the face of the wall shall have M20 bolt holes, quantity and spacing as required.

### 2.3 FINISH

Metal for dock bumpers, including hardware, shall be hot-dip galvanized conforming to ASTM A 123.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Loading dock bumpers shall be installed in accordance with the manufacturer's written instructions and as approved.

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SECTION 11400

FOOD SERVICE EQUIPMENT

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## SECTION 11400

## FOOD SERVICE EQUIPMENT

**02/97**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-01 (1995) Industrial Ventilation: A Manual  
of Recommended Practice

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 (1996) Carbon Structural Steel

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings  
on Iron and Steel Products

ASTM A 167 (1996) Stainless and Heat-Resisting  
Chromium-Nickel Steel Plate, Sheet, and  
Strip

ASTM A 240 (1996) Heat-Resisting Chromium and  
Chromium-Nickel Stainless Steel Plate,  
Sheet, and Strip for Pressure Vessels

ASTM A 269 (1994a) Seamless and Welded Austenitic  
Stainless Steel Tubing for General Service

ASTM B 32 (1995b) Solder Metal

ASTM D 520 (1984; R 1989) Zinc Dust Pigment

## AMERICAN WELDING SOCIETY (AWS)

AWS A5.8 (1992) Filler Metals for Brazing and Braze  
Welding

MANUFACTURER'S STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-72 (1992) Ball Valves with Flanged or  
Butt-Welding Ends for General Service

MSS SP-110 (1996) Ball Valves Threaded,  
Socket-Welding, Solder Joint, Grooved and  
Flared Ends

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD3 (1991) High-Pressure Decorative Laminates

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

NFPA 96 (1994) Ventilation Control and Fire  
Protection of Commercial Cooking Equipment

## NATIONAL SANITATION FOUNDATION (NSF)

NSF-01 (1994) Listings of Food Equipment and  
Related Products, Components, and Materials

NSF Std 2 (1952; Rev May 1992) Food Equipment

NSF Std 35 (1991) Laminated Plastics for Surfacing  
Food Service Equipment

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION  
(SMACNA)

SMACNA-06 (1995) HVAC Duct Construction Standards -  
Metal and Flexible

## UNDERWRITERS LABORATORIES (UL)

UL-02 (1996; Supple) Electrical Appliance and  
Utilization Equipment Directory

UL 197 (1993; Rev thru Aug 1996) Commercial  
Electric Cooking Appliances

UL 471 (1995; Rev Aug 96) Commercial  
Refrigerators and Freezers

UL 489 (1996) Molded-Case Circuit Breakers,  
Molded-Case Switches and Circuit-Breaker  
Enclosures

UL 710 (1995) Exhaust Hoods for Commercial  
Cooking Equipment

## 1.2 GENERAL REQUIREMENTS

Food service equipment shall be of the sizes and types shown. Equipment, materials, and fixtures required for use in conjunction with the items to be furnished by the Government shall be furnished and installed by the Contractor. Equipment, materials, and fixtures indicated on the drawings and schedules shown as Contractor furnished and installed, shall be furnished and installed by the Contractor.

## 1.2.1 Mechanical, Electrical, and Plumbing Work

Plumbing systems, including final connections, shall be in accordance with Section 15400 PLUMBING, GENERAL PURPOSE. Electrical equipment, motors, wiring, and final connections shall be in accordance with Section 16415

ELECTRICAL WORK, INTERIOR. Duct work and accessories shall be in accordance with Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM. Painting shall be in accordance with 09900 PAINTING, GENERAL.

#### 1.2.1.1 Strainers and Shutoff Valves

Strainers, and shut-off valves furnished under this section shall be as specified under Section 15400 PLUMBING, GENERAL PURPOSE.

#### 1.2.1.2 Control Valves and Pressure Regulators

Control valves, appliance pressure regulators for water, and vacuum breakers, wherever required on food service equipment (chrome-plated where exposed) shall be furnished under this section.

#### 1.2.2 Kitchen Fire Protection Systems

Each exhaust hood system that serves cooking equipment, associated exhaust hood system ducts, and all cooking equipment served by the exhaust hood system shall be protected with a wet chemical fire extinguishing system. The wet chemical fire extinguishing systems shall be in accordance with Section 13965 WET CHEMICAL FIRE EXTINGUISHING SYSTEM. Grease extracting type hoods that have an internal hood fire protection system do not require wet chemical fire extinguishing protection for those components of the exhaust system, and for cooking equipment protected by a UL listed internal hood fire protection system complying to NFPA 96.

#### 1.2.3 National Sanitation Foundation Standards

Food service equipment shall meet the requirements set forth by the National Sanitation Foundation (NSF). Acceptable evidence of meeting the requirements of the applicable NSF standards shall be either the equipment listed in the NSF Listing of Food Service Equipment and Related Products and display of the NSF seal on the equipment for the year the equipment was manufactured, a certification issued for special or specific food service equipment by NSF under their special one time contract evaluation and certification, or a certified test report from an independent testing laboratory, approved by the Office of the Surgeon General, indicating that the specific food service equipment has been tested and conforms to the applicable NSF standards.

#### 1.2.4 Verification of Dimensions and Coordination of Project Data

The Contractor shall become familiar with all details of the work and shall advise the Contracting Officer of any discrepancy before performing any work. The Contractor shall perform the following:

- a. Horizontal and vertical dimensions shall be field verified.
- b. Contract drawings and submittal data shall be reviewed for accuracy and completeness.
- c. The installed utility capacity and location shall be field checked.
- d. Critical systems/components shall be reviewed for application and capacities such as for exhaust hoods, refrigeration systems, fire suppression systems, gas, water, and steam/condensate line sizes and manifold configurations.

- e. Delivery shall be coordinated for access through finished openings and vertical handling limitation within the building.

#### 1.2.5 Standard Products

Materials and equipment shall be the standard products of manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. The experience used shall include applications of equipment and materials under similar circumstances and of similar size. When two or more of the same products are supplied they shall be products of one manufacturer. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

#### 1.2.6 Waste Pulping Products

- a. Manufacturer regularly and presently manufactures food waste pulping systems as one of their principal products.
- b. Installer has the technical qualifications, experience, trained personnel, and facilities to install specified items.
- c. There is a permanent service organization, maintained or trained by the equipment supplier, which will respond to a service call within 24 hours with a fully equipped service vehicle and trained service person. Submit name and address of service organization.
- d. Manufacturer has equivalent product presently installed in three installations similar to this project for 3 years, and has been in satisfactory and efficient operation for that period of time. Submit list of installations.
- e. Waste pulping system shall use type K copper piping for both supply and return lines.

#### 1.2.7 Nameplates

Each item of equipment shall bear a stainless steel, aluminum, or engraved polyester nameplate, as standard with the manufacturer, located in a conspicuous position and permanently fastened to the equipment. Name or identification plates shall be of the size standard with the manufacturer for the particular piece of equipment provided. Name plates shall reflect the name of the manufacturer/trade name, serial number, make, and model number, pertinent ratings, operating characteristics, and other information as standard with the manufacturer, date of manufacture, electrical characteristics, and other applicable data, such as flow rate, temperature, pressure, capacity, and material of construction. Separate equipment identification plates with the contract number marked thereon, shall be securely fastened to the surface of each piece of equipment.

#### 1.2.8 Omitted

#### 1.2.9 Underwriters Laboratories Standards

Electrically operated equipment shall be in accordance with applicable UL standards such as UL 471, UL 489, UL 710 and UL 197. Evidence of meeting the requirements shall be a UL label on the equipment, a UL listing mark

per UL-02 or a certified test report from a nationally recognized independent testing laboratory indicating that the specific food service equipment has been tested and conforms to the applicable UL standards.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

Food Service Equipment; GA|D.

Manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Brochures shall have front and rear protective covers with labeled project name and include an index indicating item number, quantity, description, and manufacturer, a fly sheet for each component indicating item number, name, quantity, manufacturer, optional equipment, modification, special instruction, and utility requirements, and catalog specifications sheets.

#### SD-04 Detail Drawings

Food Service Equipment; GA|D.

Data consisting of a complete list of equipment and materials. Detail drawings showing complete wiring, piping, and schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work, including clearances for maintenance and operation.

- a. Detail drawings by Contractor shall be separate drawings and shall be the contractor's standard sheet size, but not smaller than the contract drawings, and indicate the food service equipment and cold storage assemblies with itemized schedule, and special conditions drawings indicating size and location of slab depressions, cores, wall openings, blockouts, ceiling pockets, blocking grounds, access panels, and above ceiling hanger assemblies, rough-in plumbing/mechanical systems and rough-in electrical systems
- b. Detail drawings by manufacturer shall be separate drawings; sheet size shall be manufacturer's standard size and indicate item number, name, and quantity, construction details, sections, and elevations, adjacent walls, columns, and equipment, plumbing and electrical schematics, and fabricated fixtures with single electrical or plumbing connection, and service access panels required for maintenance or replacement of mechanical or electrical components.
- c. Detail drawings by the Contractor that show the size, type, and location of equipment drain lines, and floor drains. Drawings shall indicate drain lines from equipment, distances of drain lines and floor drain receptacles from equipment and aisles, and elevation views of drain piping and floor drains.

## SD-09 Reports

Testing; FIO.

Test reports in booklet format showing all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

## SD-19 Operation and Maintenance Manuals

Food Service Equipment; GA/D.

Six complete copies of the service manual, not later than 3 months prior to the date of beneficial occupancy, with data for each different item of material and equipment specified. Service manuals shall include:

- a. Front and rear protective covers with labeled project name.
- b. Index indicating item number, quantity, description, manufacturer's name, and model number.
- c. Maintenance instructions for stainless steel and plastic laminate.
- d. Manufacturer's catalog specification sheets and manufacturer's detail and control drawings.
- e. Manufacturer's operation manual outlining the step-by-step procedures for equipment installation, startup, basic operation features, and operation shutdown.
- f. Manufacturer's maintenance manual listing routine maintenance procedures, possible breakdowns, repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed.
- g. Manufacturer's list of parts and supplies with current unit price and address of manufacturer's parts supply warehouse.

## 1.4 DELIVERY AND STORAGE

## 1.4.1 Delivery

Unless otherwise directed, the following procedures shall apply:

- a. Field assembled fixed equipment integrated into structure shall be sent to jobsite when required.
- b. Fixed equipment not integrated into structure shall be sent to the jobsite after completion of finished ceilings, lighting, and acidizing of the finished floor and wall systems, including painting.
- c. Major movable equipment shall be delivered to inventory in a secured area for interim jobsite storage, or if secured area is not available, when fixed equipment installation/clean-up has been completed.
- d. Minor appliances and loose items shall be delivered to the jobsite



when the Contracting Officer is prepared to receive and inventory such items.

#### 1.4.2 Storage

Items delivered and placed into storage shall be stored with protection from weather, humidity, and temperature variation, dirt and dust, or other contaminants.

#### 1.4.3 Protection of Fixed/Fabricated Manufactured Equipment

Fiberboard or plywood shall be taped to surfaces as required by equipment shape and installation access requirements.

#### 1.4.4 Prohibited Use of Equipment

Food service equipment shall not be used as tool and material storage, work bench, scaffold, or stacking area.

#### 1.4.5 Damaged Equipment

Contractor shall immediately submit documentation to the Contracting Officer with a recommendation of action for repair or replacement and the impact on project schedule.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Materials shall conform to the following:

##### 2.1.1 Stainless Steel, Nonmagnetic

ASTM A 167 or ASTM A 240: 18-8, 300 Series, austenitic, polished to No. 3 or 4 finish on exposed surfaces.

##### 2.1.2 Stainless Steel Pipe and Tubing

ASTM A 269. Pipe and tubing shall be seamless or welded, of the gauge specified, of true roundness, and of material as specified for stainless steel. Seamless tubing shall be thoroughly annealed, pickled, and ground smooth. Welded tubing shall be thoroughly heat-treated, quenched to eliminate carbide precipitation and then drawn true to size and roundness, and ground. Tubing shall be given a No. 3 or 4 finish when exposed to view.

##### 2.1.3 Galvanizing Repair Compound

ASTM D 520, Type I pigment.

##### 2.1.4 Brazing Material

AWS A5.8, class shall be as applicable.

##### 2.1.5 Steel Structural Shapes for Framing

ASTM A 36. Structural shapes shall be uniform, ductile in quality, and shall be free of hard spots, runs, checks, cracks and other surface defects. Sections shall be galvanized by the hot-dip process, conforming to ASTM A 123.

## 2.1.6 Coatings

Coatings shall be of a durable, nontoxic, nondusting, nonflaking, and mildew-resistant type, suitable for use with food service equipment and in conformance with NSF Std 2. Application shall be in accordance with the recommendations of the manufacturer.

### 2.1.6.1 Exterior Parts

Exterior, galvanized parts, exposed members of framework, and wrought steel pipe, where specified to be painted, shall be cleaned, and free of foreign matter before applying a rust inhibiting prime and two coats of epoxy-based paint in accordance with Section 09900 PAINTING, GENERAL, unless otherwise specified. Color shall be selected by the Contracting Officer from manufacturer's standard colors.

### 2.1.6.2 Solder Material

ASTM B 32, Sn96.

## 2.2 COUNTERS

Counters shall be constructed in accordance with applicable portions of NSF Std 2.

### 2.2.1 Counter Tops

Counter tops shall be constructed of 1.9 mm (14 gauge) stainless steel with all seams and corners welded, ground smooth, and polished.

### 2.2.2 Cafeteria Counters

Cafeteria counters shall be constructed and sound deadened as indicated and as specified for counters.

### 2.2.3 Pitch and Drainage of Equipment Surfaces

Wherever a fixture has a waste or drain outlet, the surface shall have a distinct pitch toward such outlet. Corners shall be coved on 19 mm radius and sloped 10 mm per mm maintaining level crown at front edges of rolled rims, marine edges, and backsplashes, when tops are sloped to drains.

### 2.2.4 Drip Gutter ("Trough" as noted in plans and schedules)

Drip gutter shall be an integral part of the counter top and located below beverage dispensing faucets where indicated. Drip gutter shall be provided with a 25 mm brass drain tube centered in the bottom of the gutter. Bottom shall be pitched to the drain. The drip gutter shall be 100 mm wide, 25 mm deep, and the length indicated. The drip gutter shall be provided with a 100 mm wide, 25 mm high, removable, nonsplash, stainless steel, wire mesh strainer with frame.

### 2.2.5 Counter Edges and Backsplashes

#### 2.2.5.1 Counter Edges

Counter edges shall be one of the following types as shown on the drawings and the profiles as shown on Detail 1.02:

- a. Turned Down: Fifty millimeters at 90 degrees with 19 mm tight hem at bottom. Free Corners shall be rounded on 19 mm radius.
- b. Marine Edge: Turned up 13 mm and 38 mm at 45-degree angle and turned down 50 mm at 135 degree angle with 19 mm tight hem at bottom.
- c. Rolled Rim: Coved up 75 mm with 38 mm wide rim rolled 180 degrees and turned down to table top; hem edges, and bullnose corners.

#### 2.2.5.2 Counter Backsplash

Counter backsplash shall be coved up as shown on the drawings and detail 1.04 and sloped back as shown on the drawings. Turned down 25 mm at 135 degrees at the rear of the splash with the ends closed to the bottom of the top turn down. Splash turn down shall be secured to wall with 100 mm long, 1.9 mm (14 gauge) stainless steel "zee" clips anchored to wall, 900 mm on center.

#### 2.2.6 Counter Top Support Angles

Counter top support angles shall be of 38 by 38 by 3 mm painted galvanized steel angles with all corners mitered, welded, and ground smooth at perimeter. Cross members shall be provided on 600 mm centers maximum. A 100 by 100 mm, 2.7 mm (12 gauge) stainless steel triangular pad shall be provided where leg gussets are welded to the frame. Angle frame shall be stud bolted to counter top.

#### 2.2.7 Sound Deadening of Counters and Sinks

Counter tops and sinks shall be sound deadened with 13 mm wide rope sealant positioned continuously between all contact surfaces of the frame-members and the underside of counter top, overshelves and undershelves. Stud bolts shall be tightened for maximum compression and the excess sealant trimmed.

### 2.3 COUNTER BASES

Counter bases shall be open or closed as indicated.

#### 2.3.1 Closed Bases

Closed bases shall be constructed with 38 mm by 38 mm, 3 mm galvanized steel angle with all corners mitered, welded, and ground smooth. Horizontal and vertical angles shall be provided on 600 mm centers or less. The enclosure panels on closed bases shall be of 1.3 mm (18 gauge) stainless steel conforming to NEMA LD3 and NSF Std 35. Joint trim on enclosed bases shall be 50 mm wide, 1.9 mm (14 gauge) stainless steel, attached with concealed stud bolts and sealed to interior partition. Enclosed bases shall be double walled on interior, exposed ends, and at interior exposed partitions. Service access shall be provided for utilities supplying equipment designed to fit atop the counter.

#### 2.3.2 Open Bases

Open bases shall be constructed of 41 mm outside diameter, 1.6 mm (16 gauge) stainless steel rails welded 360 degrees to the legs.

#### 2.3.3 Gussets

Gussets shall be stainless steel, fully enclosed, a minimum of 75 mm in diameter at the top, reinforced with a bushing, and shall be continuously welded to channel or angle.

#### 2.3.4 Legs

Legs shall be of 1.6 mm (16 gauge), 41 mm outside diameter stainless steel tubing. Legs shall be continuously welded to gussets, channel, or angle as specified.

#### 2.3.5 Feet

Feet shall be sanitary, die-stamped stainless steel bullet-shaped, fully enclosed and shall provide for a 25 mm adjustment without threads being exposed. The bottom of the legs shall be finished off smoothly and the stem overlapped to provide a sanitary closed fitting. Feet for free-standing fixtures requiring utility connections shall be as above except with a flanged plate at the bottom which shall be anchored to the floor with noncorrosive bolts.

#### 2.3.6 Undercounter Shelving

##### 2.3.6.1 Open Base Shelves

Open base shelves shall be constructed of 1.6 mm (16 gauge) stainless steel with all edges turned down 38 mm at 90 degrees with a 19 mm tight hem at bottom. Corners shall be notched a full 90 degrees and welded from underside to completely fill the gap, ground and polished. Undershelf shall be braced with 25 mm by 100 mm, 1.9 mm (14 gauge) stainless steel channel at longitudinal center line and between each intermediate pair of legs.

##### 2.3.6.2 Closed Base Shelves

Interior shelves on closed bases shall be constructed of 1.6 mm (16 gauge) stainless steel. Side edges of the shelf shall be turned up 50 mm at 90 degrees on a 6 mm radius and sealed to the side walls. Rear of the shelf shall be coved up at 90 degrees on a 16 mm radius to shelf above or counter top, flanged out for attachment with no open space at interior. Vertical joints shall be sealed. Front edge shall be turned down 50 mm at 90 degrees with a 19 mm tight hem. The vertical seam of shelf turn down/turn up shall be welded to the face of body partition. Maximum depth of shelves shall be 560 mm except where indicated otherwise on the drawings. Shelves shall be reinforced with 25 mm by 100 mm, 1.9 mm (14 gauge) stainless steel closed hat channel. Shelf slides, where indicated, shall be 1.9 mm (14 gauge) stainless steel, 38 mm by 38 mm angles, and shall have front and back corners rounded and finished smooth.

#### 2.3.7 Tray Slides

Tray slides shall be solid type. The width of the tray slides shall not be less than 432 mm. The mounting height of the tray slides shall be as shown on the drawings. Tray slides shall be installed true and level. Tray slide shall be designed and installed to preclude tray spillage.

##### 2.3.7.1 Solid Type Slide

Solid type slide shall be constructed of 1.9 mm (14 gauge) stainless steel with the front edge rolled 44 mm at 180 degrees. The top edge of the roll

shall be 10 mm above the flat surface of the slide. Two inverted "V" forms, approximately 10 mm high, shall be provided in the flat surface of the slide as the running surface for trays. The back edge of the slide shall be turned up 25 mm at 90 degrees behind counter top turn down. Ends of the slide shall be closed to eliminate sharp edges.

2.3.7.2 Omitted

2.3.7.3 Support Brackets

Support brackets for tray slides shall be stainless steel, and shall be secured to the trim strip of the counter with stainless steel truss head bolts. Brackets shall not be spaced more than 1200 mm, center to center.

2.3.8 Protector Shelf (or as noted as breath protector)

Protector shelf shall be installed on the serving line counters and shall be located over the equipment as indicated. Protector/serving shelf shall be constructed of 1.6 mm (16 gauge) stainless steel, with a minimum width of at least 300 mm, and shall have a full 25 mm skirt with 19 mm tight hem on all sides and shall be supported on stainless steel uprights, at front. All free corners shall be rounded on a 19 mm radius.

2.3.8.1 Omitted

2.3.8.2 Fluorescent Display Light Modules

Fluorescent display light modules (not included with heat lamps) shall be in 450 mm and 900 mm increments, each with regular or deluxe white T-8 energy efficient lamps. Display lamps shall be wired to a single recess mounted master switch per serving shelf. All wiring shall be installed in flexible tubing, concealed under shelving or run inside supports or otherwise installed in a manner that results in being concealed from view. Furnish junction boxes at switch location and as needed to install conduit.

Light fixtures shall have light shields and will be mounted at the front of the shelf with the shield rotated to allow light to shine toward rear of display.

2.3.8.3 Omitted

2.3.8.4 Protector Glass

Protector glass sheet shall be no less than 6 mm thick in transparent, tempered plate glass or heat- and mar-resistant clear acrylic framed in an all welded stainless steel channel edging and shall be installed under the protector shelf and in front of the food display. At the top and bottom of the installed glass shall be a 25 mm space for vapor venting. The protector glass or clear acrylic shall be pivoted for easy cleaning. Design shall be such that glass or clear acrylic can be replaced in the event of breakage.

2.3.8.5 Food Shield (Breath Protector)

Food shield/self serve shall conform to NSF Std 2 and be constructed of 1.6 mm (16 gauge) stainless steel, with a minimum width of at least 300 mm and shall have a full 25 mm skirt with 19 mm tight hem on all sides and shall be supported on stainless steel uprights at front. All free corners shall be rounded on 19 mm radius.

- a. Adjustable louver brackets below the top shall be fitted with 6 mm

polished, tempered plate glass or heat and mar-resistant clear acrylic framed in an all welded stainless steel channel and shall be installed with a 175 mm clearance above counter top.

- b. Fluorescent light fixtures shall be installed the full length of the none heated undershelf displays. Display light wiring shall be concealed in a corner post. Fixtures shall be prewired to a single recess-mounted master switch per serving shelf.

## 2.4 DISH COUNTERS

(Sink, vegetable preparation, sink, pot and pan, soil tray table, dish table)

Dish counters shall be constructed and sound deadened as indicated and as specified for counters and sinks. The dish counters shall be fitted and flanged into the dishwashing machine with a water-tight joint.

### 2.4.1 Dish Counter Support Channels

Dish counter support channels shall be 25 mm by 100 mm by 25 mm, 2.7 mm (12 gauge) stainless steel. Channels shall be provided under dish counter top between each pair of legs and shall have closed ends. Cross members, on the centerline, shall be provided between legs. Channels shall be stud-bolted to counter top at 150 mm on center, maximum.

### 2.4.2 Dish Counter Components

#### 2.4.2.1 Scupper Drain

Scupper drain shall be provided the full width of dish counter with all corners coved, 150 mm wide by 50 mm deep, and integrally welded to the soiled/clean dish counter top at the entrance/exit of a rack-type dishwash machine. Bottom of the scupper drain shall be scored and sloped to 38 mm brass drain with tailpiece. Removable drainer shall be 1.6 mm (16 gauge) stainless steel, flush-mounted, pan-formed, perforated top, shall have 13 mm holes punched 38 mm on center, and shall be installed in the scupper opening on 13 mmdiameter stainless steel legs with closed ends.

#### 2.4.2.2 Prewash Sink

Integral prewash sink shall be 520 mm by 520 mm welded to the dish counter top with the corners rounded on 13 mm radius. The sink bottom shall be pitched to 1.6 mm(16 gauge) stainless steel disposer throat flange 38 mm brass drain. Removable rack support/slide assembly shall be a 520 mm square 1.6 mm (16 gauge) guage frame with two cross members. Two 25 mm by 3 mm stainless steel angle rack guides shall be welded on top of the frame at 500 mm apart with ends flared at 45 degrees.

#### 2.4.2.3 Prerinse Spray

A prerinse spray assembly shall be mounted on the backsplash of the dish counter with vertical tubing, wall bracket, flexible gooseneck hose, and self closing squeeze-type valve and spray.

#### 2.4.2.4 Hose Bib Faucet

A hose bib faucet shall be mounted on a 2.7 mm (12 gauge) stainless steel flange or inverted gusset below top of counter, which shall be ground and

polished to match counter top.

#### 2.4.2.5 Undershelves

Undershelves shall be the solid type, and shall be constructed as specified for open base shelves.

#### 2.4.2.6 Scraping Trough

Scraping trough in the soiled dish counter shall be 1.9 mm (14 gauge) stainless steel with all corners (19 mm (3/4 inch) coved, and shall be integrally welded to the dish counter. Trough shall be 200 mm wide minimum and shall be sloped 1 percent (1/8 inch per foot) or from 100 mm depth to integral disposer or prewash sink. Long sides of trough shall be formed on a 60 degree angle with a 13 mm by 13 mm recessed shoulder at juncture of the dish counter. Removable trough covers shall be 197 mm by 500 mm, 1.6 mm (16 gauge) stainless steel, pan formed, and the top shall be perforated (13 mm diameter holes punched 38 mm on center). One trough cover shall be provided for each 900 mm of trough. One inlet fitting shall be installed at the shallow end of the scraping trough, and intermediate inlet fittings shall be installed at 1200 mm on center. Inlet fittings shall be piped to a blending valve, vacuum breaker, solenoid valve, and shall have a globe valve at each intermediate inlet. Integral disposer sink shall be 450 mm by 450 mm by 188 mm deep, 1.9 mm (14 gauge) stainless steel with all corners coved, welded to dish counter/scraping trough and shall be fitted with a removable silverware-trap. Removable flush cover shall be 1.6 mm (16 gauge) stainless steel, 13 mm pan-formed, and perforated (13 mm holes punched at 38 mm on center) with welded corners. A finger ring shall be provided for the removal of the cover. Support clips shall be 6 mm diameter stainless steel rod, 50 mm long, formed at 45 degree angle with two 19 mm leg ends (6 mm long threaded ends). Rod-clips shall be inserted through tight clearance holes in sink corners, and sealed watertight and shall be secured with stainless steel acorn-nuts or tack-welded at exterior of sink wall. Support clips shall be set for a flush cover position (approximately 13 mm below top). A solenoid valve shall be interconnected with the disposer delay-relay control to initiate the blended water flow when the disposer is activated. All inlet fittings shall have 13 mm stainless steel tubing from blending valve to inlet fittings. Exposed fittings shall be chrome plated.

#### 2.4.3 Glass/Cup Rack Overshelf

Glass/cup rack overshelf shall be 1.9 mm (14 gauge) stainless steel with an open tube design. A horizontal rack rest of 41 mm outside diameter stainless steel tubing shall be provided the full length of the shelf and shall be supported 250 mm above the shelf on 31 mm outside diameter stainless steel tubing spaced at 1500 mm on center.

#### 2.4.4 Dish/Tray Return Shelf

Dish/tray return shelf shall be sized as indicated on the drawings. Shelf shall extend through opening in wall to be flush with the wall at the deposit side. Shelf shall be turned down 25 mm at 90 degrees at the front with 19 mm return at bottom. Rear long side shall be turned down 25 mm at 90 degrees, and shall be integral with conveyor slider pan whenever adjacent.

#### 2.4.4.1 Window Frame

Window frame shall be of 1.3 mm (18 gauge) stainless steel and shall have the perimeter flange channel-formed, 25 mm by 19 mm at both sides of the wall. Corners of the frame shall be welded. The frame shall be installed with concealed attachments. The jamb of frame shall be aligned/abutted with the end splash of conveyor slider pan, whenever adjacent.

## 2.5 CONVEYOR

### 2.5.1 Omitted

### 2.5.2 Conveyor, Gravity Flow Type

Conveyor shall be ultra high density plastic roller, gravity operated, soiled dish type, to transport standard 356 mm by 457 mm cafeteria trays, constructed in accordance with NSF Std 2, and shall be size and configuration indicated.

#### 2.5.2.1 Conveyor Trough (Pan)

The conveyor trough shall be one-piece, seamless, constructed of 1.9 mm (14-gauge) stainless steel with integral soiled landing table, trough to be depressed to accept roller sections, pan pitched to soiled dishtable where indicated.

#### 2.5.2.2 Soiled Dishtable

Table shall be one-piece, seamless, construction of 1.9 mm (14 gauge) stainless steel integral with trough, landing shelf and adjacent dishtable surfaces. Table shall be turned up 250 mm at 90 degrees and back at 45 degrees where table is against wall surfaces, turned up 75 mm at 90 degrees on all non-wall areas to form rolled rim. Table shall be mounted on 2.7 mm (12 gauge) stainless steel closed end channel supports 1500 mm on center. Legs shall be provided as specified for stainless steel gussets, legs, crossrails, and feet. Ninety degree table turns shall be equipped with 2.7 mm (12 gauge) stainless steel guide, complete with antifriction device. All corners shall be 19 mm coved radius.

#### 2.5.2.3 Roller Assemblies

Roller sections shall be (PVC plastic) (stainless steel, tubing style, with stainless steel ball bearings. Rollers shall be mounted to stainless steel hex shafts, set in 2.7 mm (12 gauge) stainless steel side rails formed to maintain trays in proper alignment. Each section end of frame shall be fitted with stainless steel plate notched for easy removal. Roller section shall be mounted in trough to allow for free movement of trays without drag. Curved sections shall have 1.9 mm (14 gauge) side rails with two rollers per shaft to negotiate corner turn.

### 2.5.3 Waste Pulping System

All components, excluding piping, of the waste pulping system shall be supplied by a single manufacturer. The system shall be capable of processing 410 kg of waste per hour.

#### 2.5.3.1 Extractor

- a. Press assembly fabricated of corrosion resisting stainless steel including housing, screw assembly, discharge assembly and other components in contact with slurry or extracted pulp.



- b. Automatic wash-down of screen with fresh water.
- c. Controlled moisture content of extracting pulp.
- d. Totally enclosed fan cooled motor mounted to gear reducer.
- e. Extracted waste return pump to pulpers for re-use, pump with fresh water flushed mechanical seal to protect drive shaft.
- f. Diaphragm actuated additive injector pump(s) with 19 liter additive tank for defoamer, deodorizer, disinfectant and cleanser.
- g. Wall mounted NEMA 4 enclosure pre-wired control panels magnetic circuit breakers interlocked with door handle, low voltage and three leg thermal overload protection.
- h. Chemical treatment for vermin and odor control.

#### 2.5.3.2 Waste Pulping Disposer and Waste Pulping Unit

- a. Housing: Cast iron, corrosion resisting stainless steel, or corrosion resisting aluminum alloy with water connection into grind chamber.
- b. Grind Ring: Rust resistant steel alloy with cutting teeth hardened and precision ground. Replaceable without replacing housing.
- c. Rotor: Rust resistant alloy with hardened steel impellers, connected directly to motor shaft and dynamically balanced. Replaceable without replacing other components.
- d. Motor: Continuous duty, splashproof, permanently lubricated, vertical shaft, with water seal.
- e. Control Center: Prefabricated, containing:
  - Magnetic starter
  - Solenoid valve
  - Time delay relay
  - Control circuit transformer
  - Floor control interlock switch
  - CRS NEMA 4 enclosure to house a through e
- f. On-Off Switch: Push buttons in corrosion resisting stainless steel NEMA 4 enclosure mounted on table near disposer.
- g. Floor stand.
- h. Silver trap.
- i. Accessories: Corrosion resisting stainless steel cone and cover.

#### 2.6 SINKS

Sink shall be of the dimensions indicated and conform to the applicable requirements of NSF Std 2. Sinks shall be constructed of a minimum of 1.9 mm (14 gauge) stainless steel. Vertical and horizontal corners shall be

rounded to a radius of not less than 19 mm with double walls at partitions.

Continuous 1.9 mm (14 gauge) stainless steel exterior filler panels shall be provided between compartments of multiple-compartment sinks and shall be ground and polished to match the adjacent surfaces. The sink bottom shall be scored and sloped to assure drainage to the waste outlet. Sinks shall be equipped with waste and overflow fittings, drain plugs with quick-opening valves, and faucets of the type specified. Faucet and drain plug, and overflow fitting shall be required for each sink compartment, unless otherwise indicated. Spout outlet of faucets shall be a minimum of 125 mm above the rim of the sink. Sink legs shall be as specified for counters, except that closed gussets shall be welded to the support channels. Sinks installed adjacent to walls or enclosures shall be anchored and sealed thereto. Sinks shall be sound-deadened as specified for counters.

## 2.6.1 Plumbing/Trim Requirements

### 2.6.1.1 Drain Plug and Overflow Fittings

Drain shall consist of a 38 mm quick opening brass body valve with side outlet overflow connection with a stainless steel twist lever handle. Removable perforated stainless steel strainer plate shall be not less than 75 mm in diameter. Overflow fittings shall consist of 31 mm diameter chrome-plated brass tubing of not less than 0.91 mm thickness connected to an overflow head in the back of the sink compartment. Overflow head shall have a removable perforated chrome-plated brass or stainless steel strainer plate of not less than 38 mm diameter. Overflow head shall be installed in die-stamped opening 25 mm below counter top.

### 2.6.1.2 Backsplash-Mounted Faucets

Backsplash-mounted faucets shall be combination fitting-type with an exposed body and concealed supply connections at the back of the sink. Fitting shall have a swinging spout of approximately 200 mm in length and inlets with 19 mm pipe thread. Faucets shall have adjustable flanges. Valves shall have indexed metal lever handles and replaceable seats.

### 2.6.1.3 Counter Top or Ledge-Mounted Faucets

Counter top or ledge-mounted faucets shall be combination fitting-type with a concealed body and with the supply connections under the sink ledge or counter top. The faucets shall have replaceable valve seats, swinging spout elevated to clear valve handle, and four-arm or lever-style indexed metal handles. Chrome-plated copper alloy or stainless steel escutcheons for valves and spout, locknuts and washers or lock-nut type escutcheons together with coupling nuts, and 15 mm pipe size union-tailpieces shall be provided.

### 2.6.1.4 Backflow Preventers

Backflow preventers shall be provided at each item of food service equipment having a water supply and waste connections, where the water inlet is connected below the flood level of the equipment. Backflow preventer shall be supplied of a size and proportion that will allow an ample flow of water to the equipment, but will prevent the backflow of waste or polluted water into the water supply system. Backflow preventers shall be as specified in Section 15400 PLUMBING, GENERAL PURPOSE.

### 2.6.1.5 Connected Overflows

Faucets and drains with connected overflows, unless otherwise indicated, shall be provided for all sinks.

#### 2.6.1.6 Water-Fill Faucets

Specialty food service water-fill faucets or hose assemblies shall be provided as indicated in drawings/specifications.

#### 2.6.1.7 Water Hammer Arresters

Water hammer arresters shall be provided for food service equipment with quick-opening or solenoid-operated water valves. Each unit shall be installed in a vertical position.

#### 2.6.1.8 Control Valve Mountings

Gusset-shaped 1.9 mm (14 gauge) stainless steel panel for the control valves shall be mounted on open base fixtures with 88 mm setback from the countertop edge/rim to the valve handle.

#### 2.6.2 Pot Washing Sinks

##### 2.6.2.1 Final Rinse Compartment

The final rinse compartment of the pot washing sink shall be equipped with a booster heater for sanitizing.

##### 2.6.2.2 Temperature Gauge

Temperature gauge shall have a 75 mm diameter face with stainless steel flange.

##### 2.6.2.3 Valves, Temperature Gauge, and Controls Mounting

Valves, temperature gauge, and controls shall be installed in a stainless steel recessed panel, ready for final connections. A perforated stainless steel casing shall be provided over the temperature bulb.

##### 2.6.2.4 False Bottom

False bottom shall be constructed of 1.9 mm (14 gauge) stainless steel, 13 mm deep pan formed with a perforated top (13 mm holes punched 38 mm on center), and shall have welded corners and finger rings. False bottom shall be fitted with 50 mm high by 31 mm outside diameter tubular stainless steel feet with closed ends.

#### 2.7 DRAIN TRENCH LINER/GRATING (FLOOR TROUGH WITH GRATE)

Drain trench liner/grating shall be of 1.9 mm (14 gauge) stainless steel in sizes as indicated with a 25 mm wide perimeter shoulder at the top, turned up flush and level with finished floor, tight-hemmed back down to the shoulder level and flanged out 51 mm for attachment to the slab.

##### 2.7.1 Interior of the Liner

Interior of the liner shall have corners coved on 19 mm radius; sloped and scored 25 mm to an integrally welded box pattern drain (drain housing only). Drains shall be at 1200 mm on center maximum and shall be fitted

with 150 mm long welded tailpiece. Drain shall be stainless steel basket type and shall include a removable scrap basket. A safety chain shall be connected to the basket strainer assembly and the top of the liner wall. Underside of sloping portion of liner shall have 50 mm long "zee" clips.

#### 2.7.2 Stainless Steel Grating

Stainless Steel grating shall be fabricated of all welded stainless steel, shall be removable without the use of tools, having 25 mm by 5 mm bearing bars. Section quantities and sizes shall be as indicated on the drawings.

### 2.8 EXHAUST HOODS OVER COOKING EQUIPMENT

Hoods and duct work systems shall conform to ACGIH-01, NFPA 96, and SMACNA-06. Hoods shall be U.L. listed per UL 710 and NSF approved. These standards represent only the minimum requirements; subsequent subsections of this clause may require construction that exceeds these minimum requirements. Unless otherwise specified, ducts and hoods shall be secured to building so as to be level and free from vibration under all conditions of operations.

#### 2.8.1 Exhaust Duct

Exhaust duct for canopy or noncanopy hoods shall be constructed of 1.3 mm (18 gauge) stainless steel and shall have external seams welded continuously, liquid tight. Duct size shall be based on a minimum air velocity of 7.6 meters per second and maximum of 12.7 meters per second. Duct shall be continuously welded, liquid tight, to hood duct collar as required by NFPA 96.

#### 2.8.2 Hood Support

Wall mounted or island type hoods shall be supported from the structure with stainless steel mounting brackets provided with hoods. Hanger rods shall be 13 mm diameter stainless steel, threaded at the bottom and designed at the top to fit into inserts in building slats above or shall have hanger attachments fastened to structural steel members. Hanger rods shall be spaced 1200 mm on center, maximum.

#### 2.8.3 Integral Make-up Air System

Hood shall be provided with an integral make-up air system which automatically replaces the air volume that is exhausted by the hood. The make-up air system shall be in accordance with NFPA 96. Air supplied upstream of the hood suction opening does not qualify as make-up air. The exhaust air flow rate for ventilation of cooking equipment shall be drawn through the open area between cooking surfaces and the perimeter entrance of the hood. Make-up air diffusers shall be provided at the front panel and at the exterior length of the hood producing a low velocity discharge. The supply air plenum shall have a 25 mm thick foil-faced fiberglass insulation at the interior of the plenum.

#### 2.8.4 Hood Lights and Wiring

Fixtures shall be U.L. Listed, recessed mounted, vapor proof fluorescent fixtures located along the full length of hood. The light fixtures shall be prewired to junction box on top of the hood. Regular or deluxe cool-white T-8 energy efficient fluorescent lamps shall be supplied. Hoods shall be factory prewired and shall have a single connection point. Hoods built in

multiple sections shall be furnished with inter-connecting junction boxes for field connection of light fixtures.

#### 2.8.5 Closure Panels

Vertical corner mullions, at removable closure panels, shall be 50 mm by 50 mm wide, 1.6 mm (16 gauge) stainless steel, and shall be welded integrally to the furring and head channel. Exhaust hood closure panels shall be 13 mm pan-formed, 1.3 mm (18 gauge) stainless steel. Upper edge of panels shall be retained in 25 mm by 50 mm continuous 1.6 mm (16 gauge) stainless steel head channel secured to the hood superstructure. Lower edge of panels shall be mounted on perimeter furring cap, and shall be turned back 25 mm and flanged up 25 mm for "zee" clip retention.

#### 2.8.6 Wall Panels

Double pan-formed wall panels shall be 1.3 mm (18 gauge) stainless steel, 13 mm thick with internal stiffener members. The panels shall be filled with a "USDA Approved" thermal insulation the full height and width of panels, and shall be attached to the interior with mastic. Maximum allowable temperature at rear side of panel shall be 49 degrees C. Lower edge and sides shall be leveled and squared. Panels shall have butt joints.

#### 2.8.7 Hand Held Fire Extinguishers

Hand held fire extinguishers shall be located at each exhaust hood and shall be suitable for gas, electric, and grease fires.

#### 2.8.8 Filter Type Hoods

Filter type hoods over cooking equipment shall be of canopy or noncanopy construction, UL listed, NSF approved, pre-engineered, and factory fabricated. Hoods shall be constructed of 1.3 mm (18 gauge) stainless steel. Internal hood joints, seams, filter support frames, and appendages attached inside the hood shall be sealed or otherwise made grease tight. Internal joints, seams, filter support frames and appendages shall be mechanically sound and sealed grease tight in accordance with the hood manufacturer's listing procedure and NFPA 96. Hoods over 3.6 m in length shall be provided in multiple, equal-length sections for mounting end to end; no section shall be less than 1.8 m in length. Hoods comprised of multiple sections shall be factory preassembled and shall be provided with predrilled mounting holes and stainless steel fasteners. Welded field joints inside the capture area and exposed to view shall be ground and polished to match the adjacent finish. UL listed full joints shall be provided per terms of the manufacturer's listing. Hoods shall be factory prewired and shall have a single connection point. Hoods built in multiple sections shall be furnished with junction boxes for field connection.

##### 2.8.8.1 Canopy Hoods

Canopy hoods shall completely cover the cooking equipment. The hood shall overhang the cooking equipment a minimum of 150 mm at each end and 300 mm in front of the equipment. Exhaust air volumes for hoods, wall or double island type, shall be a minimum of 0.51 cubic meter per second per square meter of suction opening, to provide for capture and removal of grease-laden cooking vapors, except when over wood, charcoal, and grease-burning charbroilers, which shall be a minimum of 1.02 cubic meters per second per square meter of suction opening. Exhaust air volumes for single island type hoods shall be a minimum of 0.76 cubic meter per second

per square meter of suction opening, to provide for capture and removal of grease-laden cooking vapors, except when over wood, charcoal, and grease buring charbroilers, which shall be a minimum of 1.52 cubic meters per second per square meter of suction opening. Test data or performance acceptable to the authority having jurisdiction over both shall be provided and displayed.

#### 2.8.8.2 Noncanopy Hoods

Noncanopy hoods shall be located a maximum of 900 mm above the cooking surface; the edge of the hood shall be set back a maximum of 300 mm from the edge of the cooking equipment. Exhaust air volume for the hood shall be a minimum of 0.5 cubic meter per second per linear meter of cooking surface to provide for capture and removal of grease-laden cooking vapors. Test data or performance acceptable to the Contracting Officer shall be provided and displayed.

#### 2.8.9 Grease Extracting Type Hoods

Grease extracting exhaust hoods shall be pre-engineered, factory fabricated and assembled with built-in washdown systems. Grease extracting exhaust hoods shall be of the size and type as indicated and shall be welded to the exhaust ductwork as required by NFPA 96. Hoods shall have a minimum grease extracting efficiency of 95 percent to be accomplished without the use of filters, cartridges or constant running water.

##### 2.8.9.1 Construction

Construction shall be entirely of stainless steel. Grease extraction chamber and exhaust capture chamber shall be not less than 1.3 mm (18 gauge) stainless steel. Seams or joints that direct and capture grease laden vapors shall be continuously welded, with the weld ground and polished to match the adjacent finish where exposed. The vertical joint where the front outside face of the hood meets the end panel of the hood shall be continuously welded, with the weld ground and polished to match the adjacent finish. Joints, seams, extractor chambers, and appendages shall be mechanically sound and sealed grease tight in accordance with the hood manufacturer's listing procedure and NFPA 96. Hoods over 3.6 m in length shall be provided in multiple, equal-length sections for mounting end to end; no section shall be less than 1.8 m in length. Hoods comprised of multiple sections shall be factory preassembled and provided with predrilled mounting holes and stainless steel fasteners. Welded field joints inside the capture area and exposed to view shall be, ground and polished to match the adjacent finish. Hoods shall be factory preplumbed and prewired and shall have a single connection point. Hoods built in multiple sections shall be furnished with unions and junction boxes for field connections. Canopy type grease extracting exhaust hoods shall be of the overhead type suitable for wall mounting and island-type grease extracting exhaust hoods shall be canopy-type hoods mounted back-to-back for ceiling mounting. Stainless steel mounting brackets shall be provided by the manufacturer.

##### 2.8.9.2 Omitted

##### 2.8.9.3 Automatic Washdown System

Each grease extracting type exhaust hood shall include a built in washdown system consisting of stainless steel wash manifold(s) with brass spray nozzles. The washdown system shall remove accumulations of grease and

other cooking process contaminants from the internal hood surfaces using a hot-water and detergent solution. The washdown system shall operate using water at a temperature of not less than 78 degrees C, at a flow pressure of 275 kPa minimum. A pressure reducing valve, when supply line pressure exceeds 345 kPa, shall be provided ahead of the hood control panel. The wash water and grease shall be collected within the hood(s), piped to the outside of the hoods, and interconnected to the building plumbing system through an air-gap hub assembly. Main supply water piping shall include a quarter turn ball-type shut-off valve conforming to MSS SP-72 or MSS SP-110 as applicable. As a minimum, a temperature/pressure gauge, water hammer arrester, line strainer, solenoid valve, flow check valve, detergent inlet fitting with check valve, detergent pump, detergent tank, and pump test switch shall be provided with the system. Controls, plumbing, and detergent components shall be located within a factory prewired control enclosure where indicated on the drawings. One control enclosure shall be provided for each exhaust hood or group of hoods served by a common exhaust fan. A vacuum breaker shall be furnished for the hot-water/detergent supply line from the control enclosure to the hood connection point. System operation shall be by a control system, including indicator lights, programmable clock timer, control relays and terminal blocks. "START" button shall start the exhaust fan and "STOP" button shall stop the exhaust fan and activate the timed wash cycle. System shall be capable of being activated either manually or thermostatically in the event of a fire.

#### 2.8.9.4 Internal Hood Fire Protection

Grease extracting hoods shall be furnished with piping and nozzles for a fire protection system providing protection of the exhaust hood system, grease extractor, exhaust duct system, and the cooking equipment served by the exhaust hood, per NFPA 96. Exposed piping and fittings shall be chrome-plated or stainless steel sleeved. Each grease extracting hood control panel shall be provided with a manual pull fire switch to activate the automatic washdown system and exhaust fan. Each hood shall be equipped with a full length, stainless steel fire damper located at the air inlet. In the event that a fire or heat in excess of 141 degrees C in the exhaust duct collars exists, a thermal switch shall automatically close the fire damper, turn on the automatic washdown system and turn off the exhaust and supply fans. The washdown system shall remain on as long as the thermostat is above its activation temperature and once below that temperature run for an additional five minutes. Fire dampers shall be able to be open with a reset handle without the removal of access panels. Reset handle shall be located not greater than 2.1 m above the finished floor. The controls for the hood fire protection system shall be equipped with switches to shut-off fuel-fired and electric-powered cooking equipment served by the hood, when the internal hood fire protection system is activated. The hood fire protection system shall be equipped with normally-open contacts for activating the building fire alarm system.

#### 2.9 CONDENSATE HOODS

Hood and duct work systems shall conform to ACGIH-01, SMACNA-06, and NFPA 96. Unless otherwise specified, ducts and hoods shall be secured to building so as to be level and free from vibrations under all conditions of operation. Supply and installation of exhaust fans for food service equipment and exhaust hoods shall be as specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

##### 2.9.1 Condensate Exhaust Hood Connection Provisions

#### 2.9.1.1 Exhaust Duct for Canopy or Noncanopy Condensate Hoods

Ducts shall be constructed of 1.3 mm (18 gauge) stainless steel. External seams shall be welded and liquid-tight. Duct size shall be based on a minimum air velocity of 4.06 meter per second. Duct shall be continuously welded, liquid tight, to hood duct collar as required by NFPA 96.

#### 2.9.1.2 Hood Support

Wall mounted or island type hoods shall be supported from the ceiling structure with stainless steel mounting brackets provided with the hoods. Hanger rods shall be 13 mm diameter stainless steel, threaded at the bottom and designed at the top to fit into inserts in building slats above or hanger attachments fastened to structural steel members. Hanger rods shall be spaced 1200 mm on center, maximum.

#### 2.9.1.3 Omitted

#### 2.9.1.4 Hood Lights and Wiring

U.L. listed, recess mounted, gasketed vapor-proof fluorescent light fixtures shall be provided the full length of the hood as shown on the drawings. The light fixtures shall be prewired to junction box at a rear free corner. A Cool white T-8 energy efficient lamps shall be used.

#### 2.9.1.5 Closure Panels

Vertical corner mullions shall be provided at removable closure panels, 50 mm by 50 mm, 1.6 mm (16 gauge) stainless steel, and shall be welded integrally to furring and head channel. Exhaust hood closure panels shall be 13 mm pan-formed 1.3 mm (18 gauge) stainless steel. The upper edge of the panel shall be retained in a 25 mm by 50 mm continuous 1.6 mm (16 gauge) stainless steel head channel secured to the hood superstructure. The lower edge of the panels shall be mounted on perimeter furring cap, and shall be turned back 25 mm for "zee" clip retention.

#### 2.9.2 Ducts at Dishwashing Machines

Ducts at dishwashing machines shall consist of two vertical ducts, one at each end of the dishwasher. Exposed, seamless, ducts shall be constructed of not less than 1.3 mm (18 gauge) stainless steel and shall be sized to accommodate the machine exhaust vent. The intake of each duct shall be at the top edge of the dishwasher and the ducts shall extend to 150 mm above the finished ceiling for final connection. The duct shall be trimmed at the ceiling with a 1.6 mm (16 gauge) stainless steel angle flange with corners welded. The exhaust outlet shall be connected to the exhaust system.

#### 2.9.3 Condensate Exhaust Hoods

Hoods, exposed ducts, and enclosures over dishwashing machines and the rinse compartment of pot washing sinks shall be constructed of 1.6 mm (16 gauge) stainless steel with seams welded, ground, and polished.

##### 2.9.3.1 Condensate Gutter

Hood shall be fabricated so as to form a condensate gutter 75 mm wide by 25 mm high at the perimeter and shall be provided with a condensate drain terminating at a floor sink location.



### 2.9.3.2 Duct Openings

Duct openings with collars shall be of quantity/size as indicated, with a stainless steel louvered grille at the openings. Penetrations of the dishwashing machine duct risers through the hood body shall be trimmed and sealed.

### 2.9.3.3 Ceiling Recessed Exhaust Hood at Dishwashing Machines

Hood over dishwashing machines shall be constructed of 1.6 mm (16 gauge) stainless steel with all seams welded, ground, and polished. Both long sides shall slope up to an 450 mm interior height from 150 mm above bottom edge. Body shall have a 50 mm wide perimeter flanged turned-up 19 mm at 90 degrees (increase to 250 mm width at supply air diffusers). Duct openings with collars shall be of quantity/size as indicated, with a stainless steel louvered grille at the openings. Penetrations of the dishwashing machine duct risers through the hood body shall be trimmed and sealed.

## 2.10 PREFABRICATED WALK-IN REFRIGERATORS

Refrigerators shall be prefabricated, commercial, walk-in type intended for use in dining facilities. Units shall conform UL 207, UL 471 and NSF Std 7 floorless design type and size as indicated, and the following:

### 2.10.1 General Requirements

#### 2.10.1.1 Closure Panels

Closure panels and/or trim strips to the building walls and ceiling shall be installed with concealed attachments. Closure/trim shall be of the same material as the wall panels unless otherwise noted.

#### 2.10.1.2 I-Beam Supports

Wherever compartment dimension exceeds the clear-span ability of ceiling panels, I-beam supports shall be provided on the exterior of the ceiling or supported by spline-hangers. 13 mm diameter steel rods shall be installed through beam/hangers and secured to the structure above. Beams or posts within compartments will not be acceptable.

#### 2.10.1.3 Identification Signs

Engraved phenolic plastic compartment identification signs 300 mm by 50 mm high in Contracting Officer's selection of color with 25 mm letters shall be mounted on door above view window.

#### 2.10.1.4 Door Stops

Door stops shall be provided, where necessary, to prevent walk-in refrigerator doors from striking adjacent walls, plumbing fixtures or food service equipment when door is open.

#### 2.10.1.5 Panels

Compartment shall be factory pre-fabricated modular panel construction assembled in the field. Panels shall be 102 mm thick, consisting of an inner skin of 0.040 ga stucco aluminum with baked white finish and an outer skin of 0.040 ga stucco aluminum, unpainted. The space between the inner

and outer skin will be foamed-in-place urethane which binds to the metal skin and creates a rigid 102 mm thick insulated panel. Panel edges shall be double tongue and groove with a flexible vinyl gasket along the interior and exterior perimeter of each male edge. Panels shall be assembled in the field using a cam action locking device which positions and locks the panels together, creating a positive joint. Not less than three cam locking devices shall be installed at each panel joint. The cam lock shall be located in the tongue of panel edge and shall engage a steel rod which is firmly anchored in the groove edge. The locking device shall be bonded in urethane foam and both locking arms and steel rod shall be housed in steel pockets, which are foamed-in-place. Attachment of panel section shall be from interior of compartment using hex wrench furnished by manufacturer. Wrench holes shall be recessed and covered with stainless steel plugs, which are flush with the metal skin of the building.

#### 2.10.1.6 Insulation

Urethane shall be foamed-in-place and shall have a thermal conductivity factor (K) not exceeding 0.118. Overall coefficient of heat transfer (U factor) shall not exceed 0.029. Insulation shall have 97 percent closed cell structures and an average in place density of 2.31 lbs/cubic foot.

#### 2.10.1.7 Doors

Doors shall be 914 mm by 2134 mm flush mounted, having a 1.9 mm (14 gauge) steel "C" channel style construction. Each door leaf shall consist of a heavy 100 mm wide by 0.8 mm thick thermally fused and polished PVC perimeter which secures the metal edges and creates a thermal break between metal facings. Doors shall be equipped with magnetic gasket.

Freezer door shall have an anti-condensate heater which is concealed behind the stainless steel edge of the door jamb on all sides of the opening to prevent condensation and frost formation. Heater shall be easily accessible for replacement or service.

#### 2.10.1.8 Thermometer

A digital type thermometer mounted on the strike side of the door, having a range of minus 40 degrees C to 37.2 degrees C and shall be accurate to plus or minus 1 degree.

#### 2.10.1.9 Threshold

Thresholds shall be 12 gauge stainless steel and must be an integral part of the door section. Threshold will be factory installed and shall be a universal design which allows the door section to be moved.

#### 2.10.1.10 Door Hardware

Door hinges shall be of cane lift design and shall be heavy duty chrome plated with steel pins and nylon bushings. Hinges shall have a 225 mm minimum strap of sufficient number to carry weight of door. Door latch shall be constructed of chrome plated steel. Provide an inside safety release which will open the door from the inside, meeting OSHA standards. Provide a metal placard describing emergency release procedures and attach to inside of compartment in a readily visible location.

#### 2.10.2 Floorless Refrigerator

Floorless refrigerator shall be flush with the surrounding building floor. The built-in floor shall be provided with two layers of 50 mm thick polyurethane board insulation with staggered joints set in mastic or other thickness of insulation as recommended by the manufacturer. In addition, a watertight seal formed by 0.152 mm polyethylene sheets with all joints lapped 150 mm and sealed, shall be provided on the surface of the subfloor which will support the insulation and the refrigeration floor. A 6.75 kg (15-pound) felt slip sheet shall be provided over insulation with 150 mm lapped joints flashed up the height of finished floor base. The subfloor and refrigerator floor shall each be not less than a 100 mm thickness of reinforced concrete with the insulation sandwiched between. The subfloor shall contain drain holes to drain water seepage. Beneath the floor screeds at refrigerator walls and partitions, the insulation shall be extended with a 50 mm thickness down to the insulation sandwiched between the subfloor and the refrigerator floor. The insulation beneath the door shall be as recommended by the manufacturer. The subfloor shall be supported on a fill of 50 mm clean rock aggregate having a minimum depth of 375 mm. In addition, the perimeter shall be embedded within the gravel fill to allow for air circulation.

#### 2.10.2.1 Refrigeration Systems

Remote installation and type of system for prefabricated refrigerators shall be as specified under Section 15652 COLD STORAGE REFRIGERATION SYSTEM and the following:

- a. Unit Coolers. Unit coolers shall be of specified quantity and model numbers and shall be ceiling-hung by 13 mm outside diameter nylon bolts with stainless steel washers and nuts. Hanger bolts shall be inserted through plastic sleeve with the penetrations sealed airtight.
- b. Drain Fittings. Unit cooler drain fittings shall be positioned as indicated on the drawings. Cast tee-fittings shall be installed on drain pan outlet with union and cleanout plug and shall have a 25 mm copper drainline extended through a wall panel to an air-gap fitting or floor drain.
  - 1. Drainline shall be sloped 42 mm per m, and extended to trap at exterior of the assembly, and shall turn down into drain. Drainlines of adjacent compartments shall be manifolded wherever possible.
  - 2. Plastic sleeve shall be installed through the compartment wall, and sealed around the drainline. A stainless steel escutcheon shall be installed with set screws at the exterior of the wall.
  - 3. Electric drainline heater cable shall be provided with a minimum rating of 100 watt per lineal meter, 208 volts, single phase. The drainline shall be wrapped with a maximum 50 mm loop spacing and interwired to the unit cooler for continuous operation.
- c. Rack-Mounted Condensing Unit Assemblies. Rack-mounted condensing unit assemblies shall be air-cooled units. Each unit shall be fitted with a prewired control panel.
  - 1. Oil separator shall be provided for all compressors that are positioned higher than the coil, 2.238 kW (3 hp) or larger, located more than 15.2 m from coil, and all freezer systems. The separator shall be piped to compressor crankcase with a shut-off

valve in return line.

2. Condensing units installed in an area subject to weather conditions or low ambient temperatures shall be furnished with stainless steel enclosure.
3. A 300 mm by 50 mm engraved phenolic plastic condenser identification sign shall be mount on the rack below each condenser in Contracting Officer's selection of color with 25 mm letters.
- d. Electrical Conduit. EMT conduit with pull-wire and wide-sweep bends shall be installed for refrigerant piping to remote food service equipment refrigeration systems and shall be sealed at both ends with silicone foam.
- e. System Start Up. Evacuation and charging after completion of pressure test shall be as specified under Section 15652 COLD STORAGE REFRIGERATION SYSTEM.

#### 2.11 OMITTED

#### 2.12 WATER FILTER

A cartridge-type water filter shall be provided on water supply lines to equipment as shown.

##### 2.12.1 Cartridge Filter

The filter shall remove dirt and off-taste items, such as chlorine and other medicined items. In addition, it shall reduce lime-scale problems when required by water conditions. The filter shall consist of a stainless steel pressure vessel, which includes shell top, bracket check valve, fittings and accessories, and plastic disposable cartridge. The cartridge shall be of the precoat filtration type in which a coating of particles is applied on a suitable fabric support. The filter shall contain not less than 90 percent activated carbon and 10 percent inert binders. The filter shall remove particles 2 microns and larger. The filter shall be installed with a three-position valve header, activation faucet, and by-pass valve which will be normally closed. In addition, an indication gauge shall be provided to indicate when cartridge requires replacement.

##### 2.12.2 Working Pressure and Flow Rate

The filter shall be installed as recommended by the manufacturer and be suitable for 860 kPa maximum working pressure at 38 degrees C water inlet temperature. Each filter shall have a nominal flow rate of 11.34 liters per minute. An additional replacement cartridge shall be provided for each filter.

#### 2.13 DRAIN TRENCH LINER/GRATING

Drain trench liner/grating shall be of 1.9 mm (14 gauge) stainless steel in sizes as indicated with a 25 mm wide perimeter shoulder at the top, turned up flush and level with finished floor, tight-hemmed back down to the shoulder level and flanged out 50 mm for attachment to the slab.

##### 2.13.1 Interior of the Liner

Interior of the liner shall be 150 mm deep with corners coved on 19 mm radius; sloped and scored 25 mm to an integrally welded box pattern drain (drain housing only). Drains shall be at 1200 mm on center maximum and shall be fitted with 150 mm long welded tailpiece. A safety chain shall be connected to the basket strainer assembly and the top of the liner wall. Underside of sloping portion of liner shall have 50 mm long "zee" clips.

#### 2.13.2 Aluminum Grating

Aluminum grating shall be removable, without the use of tools, with 38 mm by 5 mm bearing bars and a perimeter frame. Close bearing bars shall have a 33 mm by 100 mm centerline to centerline grid. Section quantities and sizes shall be as indicated on the drawings with a maximum of 600 mm long sections.

#### 2.14 OMITTED

#### 2.15 ELECTRICAL WORK

Electrical systems, components and accessories shall be certified to be in accordance with NFPA 70 and the following:

##### 2.15.1 Installed Equipment Load

Should the electrical load of the approved equipment differ from that specified or shown on the drawings, the contractor shall provide and install electrical service compatible with the approved equipment.

##### 2.15.2 Electrical Equipment and Components

Food service equipment furnished under this section shall have loads, voltages, and phases compatible with building system, and shall conform to manufacturer standards.

##### 2.15.3 Cords and Caps

Food service equipment cord/caps shall be coordinated with related receptacles. All 120/208/240 volt "plug-in" equipment shall have Type SO or SJO cord and a plug with ground, fastened to frame/body of item. Mobile equipment shall have a strain-relief assembly at the cord connection of the appliance. Mobile electrical support equipment (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutter, toaster, coffee makers, microwave ovens, etc.) shall have cord/cap assembly with cord-hanger as provided by the manufacturer and as indicated on the drawings.

##### 2.15.4 Switches and Controls

Each motor-driven appliance or electrically-heated unit shall be equipped with control switch and overload protection per UL 197 and UL 471. Switches, controls, control transformers, starters, equipment protection and enclosures shall be Industry standards for the equipment environment.

##### 2.15.5 Motors

Motors at 120, 240, 208/240 and 460/480 volts shall have starter with overload protection and short circuit motor protection per manufacturer standards.

#### 2.15.6 Heating Elements

Electrically-heated equipment shall have thermostatic controls. Water heating equipment shall be equipped with a positive low-water shut-off.

#### 2.15.7 Receptacles and Switches

Receptacles which are located in vertical panels of closed base bodies shall be installed in 300 mm by 215 mm by 75 mm deep recessed mounting panel sloped on a 60-degree angle and turned up to the top of the opening. Receptacles which are located in closed base fixtures shall be prewired to a junction box located within 150 mm from the bottom of the utility compartment. Receptacles which are installed in/on fabricated equipment shall be horizontally-mounted in a metal box with a stainless steel cover plate.

#### 2.15.8 Light Fixtures

Light fixtures with lamps which are installed in/on fabricated or field-assembled equipment shall be prewired to a junction box for final connection (fixtures shall be continuous run when indicated). Fluorescent display light shall be installed the full-length of the display stand and serving shelf with stud bolts or as indicated, and shall be prewired through a support post to a recess-mounted switch. Heat lamps shall be installed to underside of serving shelf assemblies as specified. Heat lamp length for chassis shall be sized per manufacturer or as indicated on the drawings. Cold storage light fixtures shall be electrically connected through the hub fitting located on the top of the fixture. Horizontal conduit shall be above the ceiling panels. Plastic sleeves shall be installed through ceiling panels for electrical conduit and the penetrations shall be sealed airtight at both sides of panel.

#### 2.15.9 Final Electrical Connection Provisions

Final electrical connection points of equipment shall be tagged with item number, name of devices on the circuit, total electrical load, voltage, and phase. Fabricated equipment containing electrically-operated components or fittings, indicated on utility connections drawings to be direct-connected, shall have each component, fitting, or group thereof prewired to a junction box for final connection. Refer to the drawings for circuit loading. Field-assembled equipment (example, prefabricated cold storage assemblies, conveyor systems, exhaust hoods) shall have electrical components completely interconnected by this section for final connection as indicated on utility connection drawing. The following groups of cold storage assembly electrical devices shall be prewired to a top-mounted junction box for final connection per compartment grouping, unless otherwise indicated.

- a. Light fixtures, switches, and heated pressure-relief vent.
- b. Door/jamb heater and temperature monitors/alarms.
- c. Evaporator fans, defrost elements, freezer fan door switch, and drain line heaters.

#### 2.15.10 Lamps

Food service equipment containing light fixtures shall have standard appliance type bulbs or energy efficient appliance type bulbs as indicated on the drawings. Exposed fluorescent lamps above or within a food zone

shall have plastic coated T-8 energy efficient lamps or standard lamps, sleeved in plastic tube with end caps.

#### 2.15.11 Steam Connection Provisions

Steam-injected equipment shall have a steam inlet globe control valve with cold handle, relief valve, strainer, condensate gate valve, bucket steam trap, and swing check valve. Compartment steam cookers shall have piping manifolded from all compartment exhaust valves to a floor drain, floor sink, or drain trench. Steam generators specified within this section shall have automatic boiler blowdown and a cold water condenser. Separate equipment, devices or components indicated to be connected to a steam-generator, provided under this section, shall be provided with all unions, ells, gate valves, nipples, brackets, clamps, etc., required for the complete operating system for final connection. The steam supply piping shall be insulated with 25 mm fiberglass insulation (48 kg per cubic meter density) and shall have factory-applied fire retardant. A full-length 1.6 mm (16 gauge) stainless steel pipe enclosure with sloping top, jacket, and vapor barrier shall be installed over steam lines.

#### 2.16 COLOR

Color shall be in accordance with Section 09000 BUILDING COLOR AND FINISH SCHEDULE.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Equipment shall be installed at locations shown in accordance with NSF-01 and the manufacturer's written instructions. The Contractor shall make provision for the plumbing, heating, and electrical connections and for equipment indicated as being furnished and installed by the Government.

##### 3.1.1 Equipment Connections

Equipment connections shall be complete for all utilities. Unless otherwise specified, exposed piping shall be chromium-plated copper alloy. Steam operating pressure shall be as indicated.

##### 3.1.2 Backflow Preventers

Backflow preventers shall be furnished as specified in Section 15400 PLUMBING, GENERAL PURPOSE. The Contractor is responsible to install backflow preventers as shown on the contract drawings and at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any source of nonpotable water, or other contaminant. Backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or will be located below the level of the contaminant. Backflow preventers shall be provided of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of waste or other contamination into the potable water system.

##### 3.1.3 Omitted

##### 3.1.4 Plumbing Work

Plumbing final connection points of equipment shall be tagged, indicating

item number, name of devices or components, and type of utility (water, gas, steam, drain). Extensions of indirect waste fitting shall be provided to open-sight hub drain, floor sink or floor drains from food service equipment.

### 3.2 CONSTRUCTION OF FABRICATED EQUIPMENT

#### 3.2.1 Grinding, Polishing, and Finishing

Exposed welded joints shall be ground smooth and finished to match the adjoining material. Wherever materials have been depressed or sunken by welding operation, such depressions shall be hammered and peened flush with the adjoining surface, and again ground to eliminate high spots. Ground surfaces shall then be polished or buffed to match adjoining surfaces. Care shall be exercised in the grinding operations to avoid excessive heating of the metal and metal discoloration. Abrasives, wheels, and belts used in grinding shall be free of iron and shall not have been used on carbon steel. In all cases, the grain of rough grinding shall be removed by several successively finer polishing operations. The texture of the final polishing operation shall be uniform, smooth, and consistent. The grain direction of horizontal stainless steel surface shall be longitudinal, including the splash back. Polishing at right angle corners shall provide a mitered appearance. Butt and contact joints shall be close fitting and not require solder as a filler. Wherever brake bends occur, the bends shall be free of open texture or orange peel appearance. Where brake work does mar the uniform appearance of the material, such marks shall be removed by grinding, polishing, and finishing. Sheared edges shall be free of burrs, projections, and fins. Where miters or bullnosed corners occur, such miters and corners shall be finished with the underage of the material and ground to a uniform condition. Overlapping of material is not acceptable. Exposed stainless steel surfaces shall have a No. 3 or 4 finish. Finishes of materials, other than stainless steel, shall be comparable in appearance to commercial mill finish. Exposed surfaces shall include:

- a. Exterior surfaces exposed to view.
- b. Interior surfaces exposed to view in doorless cabinets.
- c. Undersides of shelves shall have a ground finish of No. 90 grit or finer.

#### 3.2.2 Fastening Devices

Fastening devices shall be of the same material as the metal being joined when joint pieces are of similar metal. Fastening devices shall be stainless steel when stainless steel is joined to dissimilar metal. Stud bolts shall be a minimum of M6 stainless steel with length necessary to accept washers, and required nuts, and shall be welded 225 mm on center maximum. Exposed surfaces of equipment shall be free of bolts, screws, and rivet heads. Stainless steel stud bolts shall be used to fasten tops of counters or tables to angle framing and trim to other surfaces. Such bolts shall be of the concealed type. Threads of stud bolts which are on the inside of fixtures and are either visible or might come in contact with a wiping cloth, shall be capped with chrome plated washers, lock washers, and chromium-plated brass cap nuts. Wherever bolts are welded to the underside of trim or tops, the reverse side of the welds shall be finished uniform with the adjoining surface of the trim or the top. Dimples at these points will not be acceptable.



### 3.2.3 Welding

#### 3.2.3.1 Welding Rods

Welding shall be done with welding rods of the same composition as the sheets or parts welded.

#### 3.2.3.2 Weld Quality

Welds shall be strong and ductile. Welds shall be free of imperfections such as pits, runs, spatter, cracks, low spots, voids, and shall be finished to have the same color as the adjoining surfaces. Butt welds made by welding straps under seams, or by filling in with solder, or by grinding will not be acceptable. Welded joints shall be homogeneous with the sheet metal. Spot welding shall not be substituted for continuous welding. Joints in tops of counters, tables, drainboards, exposed shelving, and sinks shall be joined by heli-arc welding or a process other than carbon-arc welding or one that will permit carbon pick-up. Joints shall be fully welded. Counter tops shall be factory welded into lengths as long as practical in order to reduce field welded joints to a minimum. Exposed welds shall be ground smooth, flush with adjacent surface and free of burrs and sharp edges. Wherever welds occur on nonfood contact surfaces not suitable for grinding or polishing, such welds and the accompanying discoloration shall be sandblasted and coated in the factory with a nontoxic metallic-base paint. Bolts and screws shall be welded by a process that will minimize the possibility of carbide precipitation. Welds in galvanized steel made after galvanizing, and the adjacent areas where galvanizing is damaged, shall be cleaned and coated with galvanizing repair compound.

#### 3.2.4 Soldering

Soldering shall serve only as a filler to prevent leakage and shall be made with solder material. Stainless steel requiring soldering shall first be cleaned of discoloration and then have a soldering flux applied. Excess or remaining flux and catalytic material shall be removed after the soldering has been completed, and the entire soldered joint and adjacent metallic surfaces shall be cleaned with a liquid alkaline or neutralizing agent to prevent any attack on the surrounding metallic surfaces by the soldering flux.

#### 3.2.5 Brazing

Brazing shall be accomplished with brazing material. Brazing shall be used only on copper tubing to brass and bronze connection fittings.

### 3.3 TESTING

Equipment shall be inspected and tested under operating conditions after installation. If inspection or test shows defects, such defects shall be corrected, and inspection and test shall be repeated. Refrigerator tests shall include the following:

#### 3.3.1 Performance Tests

A detail written test procedure shall be submitted prior to performance of tests. The Contractor shall furnish all instruments, test equipment, and personnel required for the tests; Government will furnish the necessary

water and electricity for the installed equipment. Evidence shall be submitted that the instruments have been properly calibrated by an independent laboratory at the Contractor's expense. Performance tests for refrigeration system shall be in accordance with Section 15652 COLD STORAGE REFRIGERATION SYSTEMS.

### 3.3.2 Operating Tests

An operating test shall be performed on all items after complete installation and adjustment. The failed test item shall be corrected and the test shall be rerun.

### 3.3.3 Clean and Adjust

Debris resulting from this work, as the installation progresses, shall be removed from the jobsite. All food service equipment, prior to demonstration, shall be cleaned and polished, both interior/exterior. Drawer slides and casters shall be lubricated and adjusted. Pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, and exhaust hood grilles shall be adjusted, as required, for proper operation. Faucet aerators and line strainers shall be cleaned or replaced. Damage to painted finishes shall be touched up.

### 3.3.4 Equipment Start-Up/Demonstration

The Contractor shall obtain the services of the manufacturer's representative experienced in the installation, adjustment and operation of the equipment specified. The representative shall supervise the start-up, adjustment, and testing of the equipment, prior to the demonstration. Equipment shall be carefully tested, adjusted, and regulated in accordance with the manufacturer's instructions and shall be so certified in writing. A thorough operational demonstration shall be provided of all equipment and instructions furnished for general and specific care and maintenance. Selected items of equipment and attendees shall be scheduled, with the Contracting Officer, at least 2 weeks in advance of demonstration periods.

### 3.3.5 Item Specifications and Schedule of Equipment

All items listed on the contract drawings under the heading "Food Service Equipment Schedule" shall be provided in strict accordance with the foregoing specification requirements and with the following detailed item specifications. Also included as a part of these specification requirements is the "Schedule of Standard Details" which accompanies this Section, and follows the "Item Specifications and Schedule of Equipment".

#### ITEM SPECIFICATIONS AND SCHEDULE OF EQUIPMENT

##### 1. RECEIVING SCALE:

Specification: Commercial, 200-pound capacity dial scale on mobil stand, with casters. Hobart Model HOB 15 on Model 8280 wheeled stand, or approved equal.

##### 2. RECEIVING DESK:

Specification: Commercial, double pedestal steel desk. HON Model: HON P3262-ML, or approved equal.

##### 3. SHELVING:

Specification: Commercial, Type II, Mobile, Style I, stainless steel wire construction with five adjustable shelves, one set of two Model 5M, 127 mm swivel casters and one set of two 5 MB casters with brakes. Metro, "Super Erecta" Shelving System, or approved equal.

4. HAND TRUCK:

Specification: MIL-T-43218, steel platform, 2,000-pound capacity with solid rubber or plastic wheels, two rigid and two swivel, Size 3., Colson, Model AAR-130608MR, or approved equal.

5. SHELVING:

Specification: Commercial, Type II, Mobile, louvered/embossed solid shelving steel construction with five adjustable shelves, one set of two Model 5M, 127 mm swivel casters and one set of two 5MB casters with brakes, Metro, Super Erecta Shelving System, or approved equal.

6.-6a. FREEZER UNIT:

Specification: The freezer compartment refrigeration system shall consist of a split system air-cooled direct expansion components with the fan-coil mounted at the ceiling of the freezer compartment and the condensing unit mounted at grade outside the building. The entire refrigeration system will be designed by the manufacturer to meet the design conditions of 65.5 degrees C ambient air and minus 23.3 degrees C indoor temperature taking into consideration the altitude at the place of installation. The freezer will have a Model LSF120B fan coil; having 3-1/20 HP motors operating at 208V/1 phase/60 hz and drawing 2.7 amps. The unit will have a defrost cycle which cycles automatically and draws no more than 13.3 amps. The air cooled condenser will be a Model BOPS300L63, having a semi-hermetic compressor operating on R-40a refrigerant at 208V/3 phase/60 hertz and drawing a full load amps of 11.5 amps. Minimum circuit capacity for the system shall be 30.6 amps. Maximum overcurrent protective device will be rated at 40 amps. The fan coil will be connected to the compressor circuit and will be controlled by the control circuit and timer in the condensing unit.

Connect the condensing unit to the fan coil unit with 10 mm minimum liquid refrigerant piping and 30 mm minimum suction refrigerant piping. Manufacturer shall furnish liquid line dryer, liquid line solenoid, expansion valve, suction and discharge vibration arrestors, a timer for electric defrost, a moisture liquid indicator, suction line filter, a room thermostat, and high and low pressure controller.

Provide a type L copper, 25 mm condensate drain line from each fan coil drain pan to outside the freezer and discharge into a floor drain. Wrap the freezer drain line with electric heat tape and cover with 13 mm fiberglass pipe insulation. Freezer shall have a flush dial thermometer mounted on the outside of the compartment on the strike side of the door.

Door at freezer will be designed with electric heater wired to junction box on top of freezer compartment. Provide heater control and intermatic timer Model FF30M. Doors will be designed to receive Curtin strip curtains. An electrical connection for the lights will be directed from the electrical circuit provided for the door's electric heater. Furnish and install Boston Bumper rail Series 20 with plastic endcaps at terminations. Complete system by W. A. Brown and Sons, or approved equal.

## 7.-7a. REFRIGERATOR COMPARTMENT, REFRIGERATION SYSTEM

Specification: Each refrigeration compartment shall have a separate refrigeration system, consisting of a split system air cooled condensing unit direct expansion component with the fan coil mounted at the ceiling line, centered at back wall of each refrigerator and the condensing unit mounted at grade outside the building. The entire refrigeration system will be designed by the manufacturer to meet design conditions of 40.5 degrees C ambient air and 1.1 degrees C indoor air temperature, taking into consideration the altitude at the place of installation.

The refrigerator will have a Model LSCU90A-1 fan coil operating at 3.6 amp on a 115V/1 phase/60 hertz circuit. Defrost will be air type. The condensing unit will be a Model BOPS100M23 air cooled, with a semi-hermetic compressor operating at 208V/3 phase/60 hertz and having a locked rotor current of 4 amp and requiring a maximum fuse of 15 amp. The condensing unit and the fan coil unit will each be connected to a separate electrical circuit and will be operated by a common thermostat furnished by the manufacturer. W. A. Brown and Sons or approved equal.

Provide a separate circuit for refrigerator lights. Each compartment shall drain no more than 3.5 amps. Lighting may be connected to common circuit. Connect the condensing unit to fan coil unit and refrigerant piping as sized by the manufacturer. Furnish an expansion valve, dehydrator and sight glass, liquid line solenoid valve, high and low pressure controller, room thermostat, suctionline filter and vibration arrestors.

Refrigerators shall have a flush dial thermometer mounted on the outside of each compartment on the strike side of the door.

## 8. DOORWAY CLOSURE:

Specification: Commercial grade, transparent overlapping strip, rounded edge construction, designed for low and standard temperatures (40 degrees F to 150 degrees F), 2 mm thick vinyl strips. Model M200-4796 by Curtron Industries, Inc., or approved equal.

## 9. FAUCET HOSE STATION:

Specification: Mixed hot and cold water washdown station with temperature gauge. Heavy duty cast bronze faucet construction, 152 mm inlet to center of outlets with insulated handle suitably labeled "82 degrees C Hot Water" with 20 mm hose thread outlet. Provide two atmosphere backflow preventers for protection against both back siphonage and backflow; with 7.62 meter long insulated 19 mm hose rated for operating temperature of 93 degrees C. at maximum working pressure of 1035 kPa equipped with automatic shut-off type insulated nozzle; with stainless steel hose rack designed for wall-mounting. Model B-1451 "Thermo-Kleen #2 Washdown Station 76 mm, by T & S Food Service Specialties or approved equal. Provide a plaque for 180 degrees F hot water that reads, "DANGER, EXTREME HOT WATER" as shown in Detail 2/K4.04. Coordinate with Equipment Item No. 51a.

## 10. WALK-IN FREEZER/COOLERS:

Specification: Factory fabricated, field erected modular freezer and walk-in coolers, W. A. Brown & Sons, or approved equal. Prefabricated cooler/freezer section shall be fabricated in accordance with MIL-R 43900 and shall consist of the following:

10a	Refrigerator	Dairy	Type I Style A
10b	Refrigerator	Vegetable	Type I Style A
10c	Refrigerator	Vegetable	Type I Style A
10d	Freezer		Type II Style A

Units shall be size and shape as shown on the drawings and as required to fit the available space. Units shall be designed to fit flush with floor as detailed on drawings. Units shall have a clear floor to ceiling height of 3048 mm. The interior wall panels and ceiling and the exposed exterior walls shall be 22 gauge stainless steel with #4 finish. All unexposed exterior walls and exterior top shall be 24 gauge stainless steel. Interior and exterior finishes on the doors shall be stainless steel with #4 finish. All units shall be NSF approved. Provide a continuous row of incandescent light fixtures surface mounted down the center of each space. Lights shall be vaporproof and be capable to use bulbs up to 100 W. Lights shall be factory wired and lights for each compartment shall be wired to a junction box mounted on top of the compartment on the strike side of the door. Manufacturer shall furnish a built in light switch with red ruby pilot light mounted flush on the outside of the compartment on strike side of door. Conduit shall be concealed within the wall panel and shall extend to the junction box on top of the compartment. Each walk-in compartment shall be provided with a flush entrance door located and hinged as shown on drawing. Each door opening shall measure 914 mm wide x 2134 mm high with both the interior and exterior of door fully covered with 0.8 mm stainless steel with a # 4 finish.

Provide door heaters at the freezer door. Door heater shall be 120 volt single phase and wiring shall be extended to the lighting junction box and wired with the light circuit.

Each compartment will have a separate air conditioning system. The freezer refrigeration system is Equipment Item No. 6 and 6a and the refrigeration compartments' refrigeration system is Equipment Item No. 7 and 7a.

#### 11. AIR CURTAIN:

See Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM Mars Model No. 72C or approved equal.

#### 11a. AIR CURTAIN:

See Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM Mars Model No. 72C or approved equal.

#### 11b. OPEN:

#### 12. FLOOR TROUGH W/DRAIN:

Specification: #14 gauge stainless steel series #FT drain trough for in-floor mounting or approved equal. Trough to be Model #FT constructed of press formed sheets of 14 gauge stainless steel fully welded, ground and polished. Subway style grating, Model #SFB, and trough by Servolift Eastern, or approved equal. Dimension as shown in Plans and Schedules.

#### 12a. CAN RACKS:

Specification: 210 #10 can capacity, front loading reinforced, heavy duty aluminum construction. Cans rotate automatically. ServoLift/Eastern Model

C92-210, or approved equal.

13. CART:

Specification: One shelf, 16-gauge stainless steel fully heliarc welded, Type 300 tubular frame, 1,361 kg capacity. John Boos and Company, Model "JB", or approved equal.

14. SINK; VEGETABLE PREPARATION:

Specification: Custom fabrication, size and shape as shown on plans and schedule, constructed per specifications, with three sink compartments (712 mm by 712 mm by 407 mm each) and drain boards. At each sink provide a splash mounted gooseneck faucet, mechanical lever operated drain with built-in overflow (mounted 25 mm from top of sink rim), and strainer. Provide 457mm diameter disposal cone welded into table and coordinated with Equipment Item No. 24 and 52. By Advance Tabco, Inc., or approved equal. Disposal cone shall be Hobart "Group A" or approved equal. Front and side edges shall be semi-rolled. Back splash shall have 64 mm sloping sanitary top.

15. WASTE PULPER DISPOSER:

Specification: Somat Model D5, or approved equal, remote waste pulping system having a 4 kW disposer with 250 mm diameter cast stainless steel impeller. Disposal shall have an adjustable supporting stand and a 45 mm diameter stainless steel bowl built into countertop. Disposers to be connected to a 4 kW slurry pump having a 50 mm slurry outlet. Provide a Somat "Som-A-Trol", or approved equal control panel having a pushbutton start/stop station and an integral disconnect switch in a NEMA 4 stainless steel enclosure. Disposal bowl shall have integral water flush spouts and disposal saver. Unit shall be rated for a capacity of 400 lbs per hour of food waste. Slurry pump shall be connected to Somat waste system and coordinated with Equipment Item Nos. 24, 105, and 41/51. Contractor shall furnish interconnecting piping, fresh water and drain piping. Provide a 50 mm drain valve and copper drain line to floor sink.

16. REFRIGERATOR, ROLL-THRU:

Specification: Traulsen Model RRI-1-32 LPUT or approved equal. Exterior cabinet including front, sides, doors and louver rails of heavy gauge stainless steel. Doors heavy duty cam lift hinges and work flow door handles on self closing doors with stay open feature. Doors shall have self adjusting magnetic door gaskets. One section with self-contained energy efficient refrigeration system with condensate automatically evaporated.

17. TABLE:

Specification: Commercial, Mobile 14 ga. stainless steel, Type III preparation table with straight turn down edges, Class I with undershelf, Grade A (stainless steel top, frame, and legs), Style II, with one set of two - 127 mm diameter casters and one set of two - 127 mm diameter casters with brakes. Model SS 304 with Options listed, by Advance Tabco, Inc., or approved equal.

18. TABLE/EQUIPMENT STAND, MOBILE:

Specification: Commercial, Mobile stainless steel, Type III preparation

table with straight turn down edges, Class I with undershelf, Grade A (stainless steel top, frame, and legs), Style II, with one set of two - 127 mm diameter casters and one set of two - 127 mm diameter casters with brakes. Model SS 303 with Options listed, by Advance Tabco, Inc., or approved equal.

19. TABLE/EQUIPMENT STAND, MOBILE:

Specification: Commercial, Mobile stainless steel, mixer table with straight turn down no-drip edges, Class I with undershelf, Grade A (stainless steel top, frame and legs), with casters and brakes, Model MT-SS-302 with Options listed, by Advance Tabco, Inc., or approved equal.

20. HIGH DENSITY STORAGE SYSTEM:

Specification: Commercial grade storage system, Metro "Top Track" high density storage system; Metro Industries, or approved equal. System shall consist of two fixed end storage shelf units (FESU) with shelves and posts, two continuous tracks and mobile storage units (MSU) as shown in Plan and Schedules. Posts at end units shall be designed to engage with the track and carry the weight of the track sets. Fixed end units shall have five adjustable stainless steel shelves. Mobile shelving units shall have five adjustable stainless steel shelves and fixed 127 mm polyolefin wheels with offset stainless steel rigid horns, stainless steel prelubricated ball bearing axles. Posts shall terminate in an 18-8 stainless steel hardware with nylon roller which engages the overhead track slot. Track shall be type 6063-T6 extruded aluminum of ample size to carry its own weight with deflection limited to 8 mm.

21. WORK TABLE WITH SINK:

Specification: Table with 14 ga. stainless steel top with marine edge all sides; one model TA-11B integral sink (406 mm by 508 mm by 305 mm) on left side of table and one SS-2020 (506 mm by 506 mm by 127 mm) stainless steel drawer mounted on ball bearing slides to underside of countertop on right hand side of table. Provide a removable insert for drawer. Provide one 18 gauge. stainless steel undershelf. Sink shall be punched and recessed to receive 50 mm rotary drain with strainer and tailpiece. Provide a chrome plated mass overflow connected to drain tailpiece. Punch top for deck mounted faucets, gooseneck spout, and utility rack (Equipment Item No. 26). Model VCTC-306 with Options listed, by Advance Tabco, Inc., or approved equal.

22. MEAT SLICING MACHINE

Specification: Type II (motor operated), Class I (fully automatic), Style I (bench mounted), Feed 3 (2-speed), Hobart Model 1712E or approved equal. Manufacturer shall provide a switch.

23. VEGETABLE PEELING MACHINE:

Specification: FED-00-034-2212, Style II (motor operated), size C, (50-60 pounds per charge), complete with disposer stand, 1 HP disposer, stainless steel base and abrasive or ribbed wall cylinder, 4-minute timer, Hobart Model 6460, or approved equal. Manufacturer shall provide a switch.

24. WASTE PULPING DISPOSER WITH TROUGH CONNECTION:

Specification: Commercial, high tank pulper with hinged lid having single

trough entry, 5.5 kW pulper drive motor, 4 kW slurry pump pulper tank with UDT cone, lid and limit switch, SOMAT Model SP-75S-HT, or approved equal. Provide a Somat "Som-A-Trol", or approved equal control panel, having a pushbutton start/stop station and an integral disconnect switch in a NEMA 4 stainless steel enclosure. Unit shall have 50 mm drain outlet and drain valve. (Contractor shall provide a 50 mm brass drain line to nearest floor sink). Unit shall have 20 mm cold water connection inlet with union, 50 mm return water inlet and 18 mm water level standpipe. Coordinate with Equipment Item No. 102, 103, and 112.

25. FOOD CUTTER:

Specification: MIL-F-43402, compact, table top model with 1829 mm cord and plug, cast aluminum/stainless steel finish with #12 attachment hub for attachment accessories, Hobart Model 84145 or approved equal. Accessories to include:

Vegetable Slicer	VS9-12
#12 Plate Holder	VS9HOLD-SHG12
Grater Plate	VS9PLT-GRATER
2.4mm Shredder Plate	VS9PLT-3/32SH
4.8mm Shredder Plate	VS9PLT-3/16SH
7.9mm Shredder Plate	VS9PLT-5/16SH
12.7mm Shredder Plate	VS9PLT-1/2SH

or approved equal.

26. RACK, UTENSIL:

Specification: Table mounted, fully adjustable rack of stainless steel construction, mid-table mount installation with extension tube assembly, Model TA-228, by Advance Tabco, Inc. or approved equal, complete with SCT-48 rack and AUR-48 rack. Mounts on Equipment Item 21.

27. RANGE, ELECTRIC HOT TOP:

Specification: Heavy duty floor model hot top electric range, with forced air convection oven below. Model VR2C by Vulcan-Hart, or approved equal, shall have stainless steel front, adjustable legs, both sides, front top ledge, and backguard. Top section to consist of three hot top sections 12"w X 24"d, each with a single thermostat control.

28. PAN, FRYER AND BRAISING:

Specification: Electric heated (floor mounted) braising pan by Vulcan, Model VETS40, or approved equal. The pan shall be one-piece, 10 gauge stainless steel, and the hinged lift cover shall be stainless steel. Consoles are stainless steel at each end, drip-proof, and supported on stainless steel tubular frame with adjustable bullet feet. Heating shall be thermostatically controlled and shall be distributed uniformly across the entire pan surface. Pan tilts on trunnions connected to the gear and control console, and drains completely at full tilt, with a formed pouring lip. Provide single faucet with swing spout.

29. REFRIGERATOR, RAPID THAW ROLL-IN:

Specification: Two section thawing cabinet; Victory Model TRIS-2D-S7 or approved equal. Stainless steel case front and doors with heavy duty cam lift hinges and safety grip handles on self closing doors with safety



stops. Doors shall have self adjusting magnetic door gaskets. One section storage freezer with self-contained energy efficient refrigeration system with condensate automatically evaporated. Furnish ten 450 mm by 650 mm pans to fit in stainless steel pan slides. One section tempering power thaws, roll in cabinet with flush threshold on separate cord and plug. Bottom to be non-insulated, corrosion resistant type with wall type cart guides. The interior light shall be controlled by a door actuated switch. The light bulb(s) shall be covered with a shatter-proof cover. Furnish two roll-in, all stainless steel construction carts per victory.

30. FLOOR TROUGH WITH GRATE:

Specification: #14 gauge stainless steel Type 304-18-8 drain trough for in-floor mounting or approved equal. Trough to be Model #FT with stainless steel fully welded subway style grating, Model #SG, by IMC/Teddy, or approved equal. Dimension as shown in Plans and Schedules.

31. FROZEN FOOD CABINET (PASS-THRU):

Specification: MIL-F-43408, two section, 48.9 cubic feet capacity, stainless steel exterior and interior, full height doors, four adjustable stainless steel shelves per section, and full height food file slides per section. Doors to be hinged as shown on plans. Unit shall have a 3/4 hp condensing unit, defrost heaters, lights, and a fan. Hobart Model QSFD2 pass-thru, or approved equal.

32. OVEN:

Specification: Commercial double deck electric convection oven, Vulcan Model ECO44D, or approved equal. Cabinet front and top finished in stainless steel, sides finished in stainless steel, stainless steel oven interior, stainless steel rear body enclosure panel, and mounted on 175 mm stainless steel leg stand with adjustable feet. Tubular metal sheathed heating elements rated at 11 KW per section with a 22 KW total. Stainless steel doors to have heat resisting view windows and shall be connected in a manner that right hand door opens when opposite door is opened. Solid state controls to be side mounted with adjustable thermostat from 93.3 degrees C to 260 degrees C. Timer shall be 60-minute with audible alarm. Unit to be UL and NSF listed. Furnished with two speed 1/3 H.P. oven blower motors. Oven switch for rapid cool down. Each oven to have two sets of cords and plugs.

32. OPEN:

33. OPENER; CAN:

Specification: MIL-O-40155, Type I, with plug and cord (portable). Heavy duty electric with magnetic lid lifter. The opener will operate at the normal speed and a slower speed for difficult to open cans. Table type with a weighted base. Unit's external housing shall be manufactured from stainless steel. Edlund Company, Inc., Model #203, or approved equal.

34. MIXING MACHINE - 56.78 LITERS:

Specification: Commercial vertical Model II (floor mounted). Size 60 (bowl capacity-quarts), manual bowl lift, 15-minute timer, 2 hp motor, "Start-Stop" pushbuttons, #12 attachment hub with the following accessories

56.78 liter stainless steel bowl              Bowl - SST060

56.78 liter aluminum "B" flat beater - ALV060  
56.78 liter stainless "D" wire whip - SST060  
56.78 liter "ED" dough hooked - ALV060  
Enamel bowl truck/dolly Truck - PTDLRG  
56.7 liter bowl scraper Scraper-H/60  
Bowl guard  
Hobart Model H600, or approved equal

35. MIXING MACHINE - 18.93 LITERS:

Specification: Commercial (bench mounted). Size 20 (bowl capacity quarts), Style I (standard height), 1/2 hp motor, provided with a switch, furnish with the following accessories:

18.93 liter stainless steel bowl Bowl - SST220  
18.93 liter aluminum "B" flat beater -ALV220  
18.93 liter stainless "D" wire whip - SST220  
Bowl guard  
Hobart Model A200, or approved equal.

36. KETTLE - 151.2 LITERS:

Specification: Commercial stainless steel fully steam jacketed stationary, tri-leg, electric kettle. Eighty mm tapered plug type draw off, hinged cover, single faucet with swing spout and bracket mounted, and condensate ring at hinges (inside cover). Vulcan-Hart Company, Model #EL40, or approved equal.

37. OPEN:

38. KETTLE WITH STAND:

Specification: Commercial, two 20-quart electric tilting kettle modules. Kettles on stainless steel base with stainless steel 152 mm adjustable legs, elevated single swing faucet mounted on top of cabinet. Controls and drain mounted and interconnected inside cabinet base. Vulcan-Hart Company, Model No. 2T2036E or approved equal.

38a. OPEN:

39. HOOD, EXHAUST - ISLAND STYLE:

Specification: Custom fabrication, hood to be size and shape as shown on plans and specifications, stainless steel with automatic grease washdown system, electronically controlled fire damper with manual reset, make-up air plenum, fluorescent lights shall be provided from Equipment Item No.39b, stainless steel enclosure panels to ceiling. Cut-out of 629 mm by 210 mm required for the installation of each hood light fixture. Hood to meet NFPA No. 13 and No. 96 requirements. Model AWWP by AVTEC Industries, Inc., series with remote control panel or approved equal. Number of cutouts for light fixtures are indicated in the KITCHEN EQUIPMENT SCHEDULE on the drawings. Hood Panels (ventilator control panels) shall be recessed type (with mounting flanges) in locations as shown in Plan with conduit/piping access through panel's back or top/bottom of CMU cells. NO conduit/piping shall be exposed to view.

39a. OPEN:

39b. HOOD LIGHT FIXTURE:

Specification: Commercial, fluorescent lighting fixtures to be installed in the kitchen equipment canopy hoods, two fluorescent lamps, thermally protected ballast, prewired for use, tempered glass prismatic diffuser, stainless steel exposed trim. Internal components protected from grease, heat, and moisture. Light switch will be prewired and mounted onto the hood. Coordinate with Kitchen Item Nos. 39, 53, 55, 71, and C-10. Standard-Keil, 2111 Series Centerion, or approved equal. Also, provide two 610 mm long fluorescent lamps per fixture. Lights to be controlled from hood panel.

40. FLOOR TROUGH WITH GRATE:

Specification: Series FT-21, #14 gauge stainless steel drain trough for infloor mounting, with Series SFB-21 subway style stainless steel grating. ServoLift/Eastern Corporation Series 21, or approved equal. Refer to Plans and Schedule for size.

41. FIRE SUPPRESSION SYSTEM:

Specification: Commercial, wet chemical system installed in accordance with manufacturer's recommendations and in compliance with NFPA Bulletin No. 96. System to provide duct and plenum protection to Item No. 39, exhaust hood and surface protection located under the hood. Locate chemical cylinder as required and install piping to hood in a totally concealed manner. Exposed piping/fittings in exhaust hood to be chrome plated or sleeved with stainless steel tubing. Remote manual release to be located under cylinder. Ansul Fire Protection, Model R-102, or approved equal system. Stainless Steel tank enclosure and manual pull station shall be recessed (with mounting flanges) in location as shown in Plan, with conduit/piping access through panel's back or top of CMU cells. No conduit/piping shall be exposed to view.

41a. FIRE SUPPRESSION SYSTEM:

42. FRYER/DRAIN STATION WITH FILTER (COMBINATION) UNIT:

Specification: Commercial, two electric, floor model instant recovery deep fryers, Keating, Model 20 TS Electric and one Pitco Frialator, Inc. Model BF14 filter Model BF 14 filter. Fryers shall be stainless steel cabinets. Built-in filter system shall be integrated into the fryer line. Provide a filter pump capable of moving 21.2 liters per minute. Provide a stainless steel filter pan mounted on glides for easy removal, and having a latching device for securing filter media into pan. Provide two nickel plated oblong wire mesh baskets and one nickel plated square wire mesh per fryer unit. Furnish infrared heat foot warmer over drain station, Keating Model 2LCF (built-in), mounted to backsplash over drain station.

43. OPEN:

44. FRYER/DRAIN STATION WITH FILTER (COMBINATION UNIT):

Specification: Commercial, two electric, floor model instant recovery deep fryers, Keating, Model 20 TS Electric and one Pitco Frialator, Inc. Model BF14 filter Model BF 14 filter. Fryers shall be stainless steel cabinets. Built-in filter system shall be integrated into the fryer line. Provide a filter pump capable of moving 21.2 liters per minute. Provide a stainless steel filter pan mounted on glides for easy removal, and having a latching device for securing filter media into pan. Provide two nickel plated oblong

wire mesh baskets and one nickel plated square wire mesh per fryer unit. Furnish infrared heat food warmer over drain station, Keating Model 2LCF (Built-in), mounted to backsplash over drain station.

45. WATER METERS:

Specification: Automatic hot and cold manual mixing valve having a capacity of 90.7 kg/minute with wall mounting bracket. Meters to be accurate to 1 percent plus or minus, Stoppil Model AMM, or approved equal.

46. TABLE; BAKERS:

Specification: Type I (square edge and top), Class I, with open pipe base, Grade A stainless steel top, frame and legs, Style I bullet feet. Advance Tabco, Inc., Model TVSS-306 with Options listed, or approved equal.

47. COOKER; STEAM:

Specification: Electric, convection steamer on cabinet base with separate manual compartment controls. Vulcan-Hart, Model VL2GPS-2, or approved equal; each compartment with heavy duty "slammable" doors and door latch mechanisms and stainless steel base cabinet with door for storage.

48. HAND SINK:

Specification: Commercial, one compartment, splash mounted faucet with gooseneck spout, mechanical lever operated drain, back splash, stainless steel construction, wrist operated controls, skirt and P-trap with overflow, basket drain, and soap and towel dispenser. Advance/Tabco, Model 7-PS-85, or approved equal.

49. INGREDIENT BIN; MOBILE:

Specification: Commercial 75- to 100-pound capacity mobile stainless steel bin, slide-off cover, 102 mm diameter rubber casters and wrap-around rubber bumper. Seco Products Corporation, Model No. 47-75, or approved equal.

50. POT SANITIZER:

Specification: Commercial, automatic door type utensil washer with timed cycles. Hood and tank of 14 gauge, 18-8 type 304 stainless steel, two doors for pass-thru operation, stainless steel front panel, 5 kW electric immersion heater or steam injector, side mount controls with overload protection in NEMA 12 housing. Wash and spray system constructed of 18-8 type 304 stainless steel. Provide stainless steel exhaust vent ducts and 9 kW hot water booster heater. Insinger Model No. CA-3 or approved equal.

50a. TABLE, DRAIN BOARD:

Specification: Commercial, 14 gauge stainless steel, Type III preparation table with straight turn down edges, with drain Class I with undershelf, Grade A (stainless steel top, frame, and legs). Model VSS 365 by Advance Tabco, Inc., with Options as listed or approved equal.

50b. OPEN:

51. POT AND PAN SINK:

Specification: Custom fabrication, 14 gauge, 304 stainless steel, three

compartment sinks (508 mm by 711 mm by 407 mm each), two drainboard sink units, 229 mm high backsplash with coved corners, sump sink, backsplash mounted swing faucets with writs blades and gooseneck spout at each sink, one sink to receive heat resistant faucet handles for 180-degree hot water and plaque as shown on Equipment Elevation, mechanical lever operated drains with built-in overflow with strainer mounted 25 mm from top of sink rim at each sink except sump sink, one wire mesh stainless steel basket at each sink, and 457 mm diameter disposal cone welded into table with control bracket and faucet holes. Similar to a modified Advance Tabco "Regaline" 940 Series sink units with Options as listed, or approved equal. Warewasher Connection and Table Trough shall be provided per Standard Detail 2.03. Disposal Cone shall be Hobart Model "Group A" or approved equal. Splash mounted heat resistant faucet handles shall be T & S #8700 or approved equal. Coordinate with plans and schedules and Equipment Item No. 24, 51a, 52, 54, and 55.

51a. BOOSTER HEATER:

Specification: Commercial, electric 15 kW compact booster heater, 16-gallon storage capacity, 572 liters/second. Eighty-two and two tenths degrees C hot water at 23 degrees C degree rise. Stainless steel body and base, slide mounting brackets for mounting under sink drainboard, shock absorber, pilot light and on/off switch, low-water cut-off, provide one booster heater for Item #51, pot and pan sink, from Hatco Corporation, Model No. S-15 or approved equal. Provide and install combination T&P valve with 20 mm drain extended to floor sink. Provide 20 mm drain valve and drain line to floor sink. Coordinate with Equipment Item No. 51.

Specification: Commercial, refrigerator, mechanical, commercial, self-contained (reach-in), electric, .7 cubic meters with 152 mm legs, stainless steel, cord and plug, Traulsen Model RHT-1-32 WUT, or approved equal.

52. PRE-RINSE SPRAY:

Specification: Commercial deck mounted with wall bracket, spring action type with gooseneck, T&S Brass and Bronze Works, Inc., Model B-113, or approved equal. Coordinate with Equipment Item No. 51.

53. HOOD, EXHAUST:

Specification: Custom fabricated, size and shape as shown on plans and specifications, all stainless steel construction, perimeter gutter with drain, balancing damper at duct collar, fluorescent lights shall be provided from Equipment Item No.39b. A cut-out of 629 mm by 210 mm is required for the installation of the hood light fixture. The mounting height of the hood should be coordinated with the clearance required to remove the doors of the pot sanitizer, item 50. A stainless steel drain line shall be extended from the hood to the floor sink below (Both 53 and 54). Gaylord Industries, Inc., Model VH-W, or approved equal. Number of cutouts for light fixtures are indicated in the KITCHEN EQUIPMENT SCHEDULE on the drawings.

54. SINK HEATER; BOOSTER:

Specification: Nine kW, 83 degrees C sanitizing sink heater, connect to bottom of sink compartment in Equipment Item No. 51, where shown on plans, Hatco, Model No. 3CS-9 with rinse temperature monitor and rinse light, or approved equal. Number of cutouts for light fixtures are indicated in the

KITCHEN EQUIPMENT SCHEDULE on the drawings.

55. HOOD; CONDENSATE EXHAUST:

Specification: Custom fabricated, size and shape as shown on plans and specifications, all stainless steel construction, perimeter gutter with drain, balancing damper at duct collar, fluorescent lights shall be provided from Equipment Item No.39a. A cut-out of 629 mm by 210 mm is required for the installation of the hood light fixture. The mounting height of the hood should be coordinated with the clearance required to remove the doors of the pot sanitizer, item 50. A stainless steel drain line shall be extended from the hood to the floor sink below (Both 53 and 54). Gaylord Industries, Inc., Model VH-W, or approved equal. Number of cutouts for light fixtures are indicated in the KITCHEN EQUIPMENT SCHEDULE on the drawings.

56. CART, POT AND PAN STORAGE:

Specification: MIL-T-43047, Type I five shelves, two fixed and three adjustable, 800-pound capacity with four swivel type casters and bumpers, stainless steel louvered shelves, Seco, Model No. 9908, or approved equal.

56a. RACK; STORAGE FOR MIXER ACCESSORIES:

Specification: MIL-R-43870, mobile stainless steel with casters, two shelves, 14 gauge stainless steel, overhead attachment rack, two sets of 127 mm diameter swivel casters and two sets of 127 mm diameter casters with brakes. ServoLift/Eastern Corporation, Model No. 1005-A.

57. OPEN

58. OPEN

59. OPEN

60. BREAD DISPENSERS:

Specification: Commercial, unit to be stainless steel construction with tempered glass front, front loader and three slot model, Serv-A-Slice Industries, Model A-3L, or approved equal.

61. BUTTER DISPENSER:

Specification: MIL-D-43953, stainless steel, counter model with tray holder and two eutectic cooling cartridges. Serv-A-Slice, Model B-5, or approved equal.

62. DISPENSER; BREAD AND BUTTER PLATES:

Specification: MIL-D-4063, Type VI, dish dispenser, unheated, with enclosed cabinet, Style 4, four dispensing units, Size 7 (6-3/4 inch diameter plate), Model A (mobile, casters), 272 capacity one piece wrap around with bumper, ServoLift/Eastern Corporation, Model 2AT4-ST, or approved equal.

63. COLD THREE-PAN DROP-IN:

Specification: Commercial, drop-in, mechanically cooled, one-piece construction, stainless steel with condensing unit located below cold pan,

on/off switch, with adapter bars, three opening-capacity, plug and cord, Atlas Metal Industries, Model WCM-3, or approved equal. Refrigerator compressor units shall be equipped with a remote. Coordinate with Equipment Item No. 64. Mobil unit.

63a. SHELF; PROTECTOR (LIGHTED):

Specification: Coordinate size and shape as shown on plans and schedule, based on Atlas Metal Industries, Model OSC-3 or approved equal. Install one continuous row of fluorescent lights under cover. Switch for lights shall be mounted in cut-out on face of Equipment Item No. 64. Lights shall be completed with fluorescent tubes with clear plastic safety shields with end caps.

64. OPEN

64a, 64b, 64c, 64d, 64e, 64f and 64g. TRAY SLIDE:

Specification: Custom fabricate, tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans and specifications.

65. CARVING STATION:

Specification: A single server unit, with stainless steel cart, steam pan, gravy pan, heat lamp, and end panels, for serving meat, fitted with stainless steel perforated flat top with two sets of four-pronged meat holders, and easy roll, pull swivel casters. Based on Atlas Metal Industries, or approved equal.

66. HOT FOOD WELL (THREE PAN):

Specification: Commercial, drop-in type, three pan capacity, electrically heated stainless steel, with drains, coved corners, with adapter bars, thermostatically controlled, outer case 22-gauge stainless steel, inter liner 18-gauge, Type 304, 18-8 stainless steel, Atlas Metal Industries, Model WIH-3, 208 volts or approved equal. The hot food well shall be equipped with drains and a manifold. Mount in Equipment Item No. 67 as shown in plan. Each hot food warmer shall have three individually heated well, each measuring 305 mm x 508 mm x 152 mm deep. Mobil unit

66a. SHELF PROTECTOR (SNEEZE GUARD):

Specification: Custom fabricated, size and shape as shown on plans, schedule, and specifications, based on Atlas Metal Industries, Model PRCL, or approved equal. Modify length as required. Include one continuous row of fluorescent lights under top shelf. Mount on Equipment Item No. 67 and Coordinate with Equipment Items Nos. 66 and 141. Switch for lights shall be mounted in cut-out on face of Equipment Item No. 67. Lights shall be completed with fluorescent tubes with clear plastic safety shields with end caps.

66b. SHELF PROTECTOR (SNEEZE GUARD):

Specification: Custom fabricated, size and shape as shown on plans, schedule, and specifications, based on Atlas Metal Industries, Model OSDC, or approved equal. Modify length as required. Include one continuous row of fluorescent lights under top shelf. Mount on Equipment Item No. 67 and Coordinate with Equipment Items No. 66. Switch for lights shall be mounted in cut-out on face of Equipment Item No. 67. Lights shall be completed with

fluorescent tubes with clear plastic safety shields with end caps.

67. COUNTER; HOT/GRILL:

Specification: Custom fabricated, size and shape as shown on plans, schedule, and specifications, 14 gauge 304 stainless steel top with 18 gauge stainless steel undershelf. Provide cut-out for light switch (#66a) in front face. Coordinate with Equipment Item No. 66, 66a, 66b, 64a, and 64a where applicable. Mobil unit with castors (102 mm diameter rubber) where indicated.

67a. TRAY SLIDE:

Specification: Custom fabricate, tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans and specifications.

68. DISPENSER; DINNER PLATES:

Specification: Commercial, dish dispenser, unheated, Design A, enclosed cabinet, Style 2, two dispenser units, Size 9 (9-inch dinner plate), Model A (mobile, casters) 126 plate capacity, with bumper guards, ServoLift/Eastern Corporation, Model 2AT6-ST, or approved equal.

69. GRIDDLE:

Specification: Commercial, electric griddle, Keating, Model 48 X 30 Electric Griddle, or approved equal. Griddle plate of high carbon 18mm steel, having a drain trough and perimeter installed in a stainless steel cabinet equipped with electric elements. The griddles should be equipped with a top side cooker and 100 mm legs. The top side cooker consists of cooking plate with an electrical control, electrical elements, and removable cooking sheet and a cool to the touch handle. Coordinate with Equipment Item No. 70.

70. GRIDDLE STAND:

Specification: Commercial, stainless steel tubular stand with reinforced stainless steel undershelf and casters, stand for Equipment Item No. 69, Keating of Chicago Manufacturer griddle stand, or approved equal.

70a. SPLASH GUARD:

Specification: Custom fabricated, 16 gauge stainless steel, size and shape as shown on plans and schedule. Coordinate location with Equipment Item Nos. 70 and C12.

71. HOOD EXHAUST:

Specification: Custom fabrication, hood to be size and shape as shown on plans and specifications, stainless steel with automatic grease washdown system, electronically controlled fire damper with manual reset, make-up air plenum, stainless steel enclosure panels to ceiling, fluorescent lights shall be provided from Equipment Item No. 39b. A cut-out of 629 mm by 210 mm is required for the installation of the hood light fixture. Hood to meet NFPA No. 13 and No. 96 requirements. Model AWWP by AVTEC Industries, Inc., series with remote control panel or approved equal. Panels shall be recessed type (with mounting flanges) in locations as shown in Plan with conduit/piping access through panel's back or top/bottom of CMU cells. No conduit/piping shall be exposed to view.



## 72. FIRE SUPPRESSION SYSTEM:

Specification: Commercial, wet chemical system installed in accordance with manufacturer's recommendations and in compliance with NFPA Bulletin No. 96. System to provide duct and plenum protection to Item No. 71, exhaust hood and surface protection located under the hood. Locate chemical cylinder as required and install piping to hood in a totally concealed manner. Exposed piping/fittings in exhaust hood to be chrome plated or sleeved with stainless steel tubing. Remote manual release to be located under cylinder. Ansul Fire Protection, Model R-102, or approved equal system.

## 73. CABINET; PASS-THRU WARMER:

Specification: Two-section, upright, stainless steel exterior and interior, full height stainless steel doors, 152 mm high stainless steel legs, automatic interior lighting, mount with exterior thermostat control on kitchen side, Continental Refrigeration, Model DL2W-SS-PT, or approved equal.

## 74. CABINET, PASTRY STORAGE:

Specification: MIL-C-40617, stainless steel 40-pan capacity, mobile with 127mm casters, wrap-around vinyl bumper, single door, front loading, stainless steel, ServoLift/Eastern Corporation, Model No. EC72-1826-40, or approved equal.

## 75. COUNTER; DESSERT:

Specification: Custom fabricated to be size and shape as shown on plans, schedule and specifications, 14 gauge, 304 stainless steel top with 18 gauge undershelves. Provide cut-out for light switch (#77) in face. Provide stainless steel bracket for electrical outlet needed for #76. Coordinate with Equipment Item No. 76, 77, and 77a.

## 76. COLD FOOD, FIVE-PAN DROP-IN:

Specification: Commercial, one piece construction, drop-in 16 gauge stainless steel self-contained with condensing and compressor unit built-in, with perimeter drain trough, on/off switch, Atlas Metal Industries, Model WF-5, or approved equal. Mount in Equipment Item No. 75.

## 77. BREATH PROTECTOR DISPLAY SHELVES:

Specification: Commercial, glass display shelves supported by 19 mm square stainless steel shelves, sneeze guard mounted on adjustable brackets, coordinate length, Duke Model 985-FL. Provide one continuous row of fluorescent light fixtures under top shelf. Mount on Equipment Item No. 75. Switch for lights shall be mounted in cut-out on face of Equipment Item No. 75.

## 77a. TRAY SLIDE:

Specification: Custom fabricated, tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans and specifications. Tray slide shall be mounted onto Equipment Item No. 75.

## 78. REFRIGERATOR; ROLL-THRU:

Specification: MIL-C-43427, Type I (refrigerated cabinet), Class 2 (double cabinet), Enclosure I (self-contained 1, compressor unit), Duty B. (air cooled compressor/condenser unit), roll-thru, Style A non-insulated, corrosion-resistant bottom with wall type cart guides, stainless steel exterior/interior, two stainless steel angle slide roll-in racks 457 mm by 661 mm (18-inch by 26-inch) pans on 76 mm centers, with vertical bumpers and casters, two with brakes, for each cabinet, Hobart Model QESD2, or approved equal.

79. TOASTER:

Specification: Commercial, Type I, Size 3, (960 slices per hour) conveyor type, 5 kW heating element, Hatco Model TK-100, or approved equal.

80. DISPENSER; SODA:

Specification: Commercial, post mix beverage dispenser with five electric valves, integral carbonator 1/4 hp, and standard one-piece removable drip pan, IMI Cornelius, Inc., Model No. 417405 Venture, or approved equal. Contracting Officer Representative and Hunter AAF personnel shall specify franchise and flavor identification before installation.

81. BEVERAGE COUNTER W/ TROUGH:

Specification: Custom fabricated, size and shape as shown on plans, schedule, and specification, 14 gauge stainless steel countertop, 18 gauge stainless steel undershelf, 18 gauge stainless steel fronts, and six 18 gauge stainless steel hinged doors under tray slide mounts. Coordinate with Equipment Item No 81a, 79, 126, 61, 98, 63, 63a, 80, 84, 85, and 84. Provide hole in countertop for Equipment Item No. 85 as shown in plan.

81a. TRAY SLIDE:

Specification: Custom fabricated, tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans and specifications. Tray slide shall be mounted onto Equipment Item No. 81.

82. FRUIT JUICE DISPENSER:

Specification: With 6 fast flow valves and illuminated hood. Based on IMI Cornelius INC Models 41-2166-753 and 31-4744-000, or approved equal.

83. SANDWICH UNIT W/SNEEZE GUARD:

Specification: MIC-S-43852, Size 2, Style A (8.7 cubic feet storage capacity) with bumpers and casters, minimum of two shelves, self-contained, with four 1/4 size pans, three 1/3 size pans, Derfield, Model No. 18448-32, or approved equal.

84. ICE MAKER, DISPENSER:

Specification: Commercial, countertop, manual load with automatic dispenser head, 250-pound storage capacity, stainless steel exterior, Servend International, Model M-250, or approved equal.

85. DISPENSER; JUICE:

Specification: MIL-D-82035, Type II, (dispenser with agitation system, but

without aeration), Type B (twin bowls with covers), mechanically refrigerated self-contained, Size II (capacity of 19 liters per bowl), counter model, Jet Spray Model JT20, or approved equal.

86. BEVERAGE COUNTER WITH TROUGH:

Specification: Custom fabricated, size and shape as shown on plans, schedule and specification, 14 gauge stainless steel top with integral drain trough, 18 gauge undershelf, 18 gauge front and hinged door. Coordinate with Equipment Item No. 86a, 95, 99, 85, 80, 84 and 87 (where applicable). Hinged door shall be fully louvered for counter which supports Equipment Item No. 95 since a pre-heater is housed therein. Verify with Pre-heater manufacturer.

86a. TRAY SLIDE:

Specification: Custom fabricate, tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans, schedule, and specifications. Mount onto Equipment Item No. 86, and extend in "x" direction to include both Equipment Items No. 88.

87. DISPENSER; MILK:

Specification: FED-00-D-450, Type I (dispenser with manually-operated gravity fed lift type dispensing valve), Style A (front loading), Size 3/5 (three 5-gallon milk containers), counter mounted with adjustable 102 mm legs, stainless steel mechanical cooled, self-contained, Silverking Model SK-3, or approved equal.

88. DISPENSER, CUP AND GLASS:

Specification: MIL-D-40631, Type II (cup, tumbler and bowl rack dispenser, unheated), Design C cantilevered carrier), Size 2 (508 mm by 508 mm racks), Model A (mobile, casters), with one piece wrap-around bumper, ServoLift/Eastern Corporation, Model CCA-ST, or approved equal.

89. OPEN:

90. FOOD WARMER:

Specification: Commercial, stainless steel wet or dry foods or liquids, heated food well, thermostat controlled 32 degrees C to 99 degrees C with amber indicator light, front mounted protector ring with 4 Qt, 7 Qt, 11 Qt. adapter tops and insets with lids, Wells Manufacturing, Model SW-10 and Accessories as listed, or approved equal.

91. FLOOR TROUGH WITH GRATE:

Specification: Trough shall be sized as shown on plans and schedule and supplied with Model #SG Type 304 stainless steel, Type 304 grating, trough shall have stainless steel basket type drain and accommodate up to 75 mm diameter waste pipe, Model #FT, 14 gauge stainless steel fully welded drain trough for in-floor mounting, as manufactured by IMC/Teddy, or approved equal. Coordinate with Equipment Item No. 92.

92. ICE MAKING MACHINE:

Specification: Air cooled, ice cuber machine, produces up to 870 pounds of dice ice per 24 hours with 950-pound capacity storage bin, stainless steel

cabinet, 165 mm high stainless steel legs, Maintowoc Company, Inc., Model BD-1002A on Model C-950 bin, or approved equal. Coordinate with Equipment Item No. 91.

93. OPEN

94. RACK, SYRUP TANK:

Specification: Commercial, stainless steel syrup tank rack with safety chain to secure CO2 containers, three tier, capacity 25 canisters, solid top, reinforced bottom shelf, ServoLift/Eastern Corporation, Model STR3, or approved equal.

95. COFFEE DISPENSER with PRE-HEATER:

Specification: Commercial coffee system with a service capacity up to 1,500 cups per hour and a concentrate of over 800 cups per filling for coffee. Model PRESTIGE K-72 by Douwe Egberts Coffee Systems or approved equal. Provide a compact pre-heater with a 37.8 liter tank size with a temperature range 43 degrees C to 77 degrees C and preset at 49 degrees C. Model 6E730 by Vanguard or approved equal per coffee dispenser manufacturer. Pre-heater shall be housed and coordinated in Counter base Equipment Item No. 86 with louvers/vents as recommended per pre-heater manufacturer.

96. OPEN

97. OPEN

97a. TRAY SLIDE:

Specification: Custom fabricate (as required) tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans and specifications. Mount onto Equipment Item No. 134. (NOTE) Tray slide may be provided by salad bar (No. 134) manufacturer.)

98. RACK CONDIMENT PACKS:

Specification: Commercial, rack and bins for storage of individual packets of condiments, nine bin capacity, Cambro Manufacturing Company, Model 9R9, or approved equal.

99. CAPPUCCINO MACHINE:

Specification: Automatic, 18.9 liter capacity with 3 hoppers, steel construction, fluorescent lighting, stainless steel drip tray, and self cleaning. Based on Fast Flow Cecilware model GB3-LD.

100. OPEN

101. SOFT SERVE MACHINE:

Specification: MIL-I-43705, two 18.9 liter capacity hoppers, two 3.2 liter freezing cylinder, electronic controls, power interrupt and lockout. Two 1.1 kW beater motors, draw valve lock kit, self-serve package, air cooled, self-contained, mobile with casters, Taylor Company, Model 754, or approved equal.

102. CONVEYOR, SOILED TRAY TABLE:

Specification: Custom fabricated, size and shape as shown in plans, schedule and specifications, conveyor to be full (376 mm long) rollers RA-29-P angle frame construction with raised plastic rollers on approximately 102 mm centers, gravity operated (pitch not to exceed 7 degrees) to transport 356 mm by 452 mm cafeteria trays. Provide plastic strip curtains at opening into Dishwashing Room over each conveyor pan, roller assemblies to be R-40-P Noiseless Plastic Rollers by Caddy Corporation, or approved equal. Coordinate length and design with plans and adjacent Equipment Items No. 15, 103, and 115.

103. SOILED DISHTABLE WITH TROUGH:

Specification: Custom fabricated, size and shape as shown on plans, schedule and specifications, coordinate layout and design with Equipment Item No. 24, 102, 112, 104, 108, and 115. Trough profile shall meet requirements of Item No. 15 manufacturer. Trough length as required and anchored to Item No. 102. Provide a 457mm diameter disposal cone with control bracket by Hobart "Group A" or approved equal and weld into dishtable top.

104. DISHWASHER MACHINE:

Specification: FED-00-D-1390, Style I (electric heat), Type 4 (power wash, power rinse and final rinse), 380 racks/hour capacity, auxiliary electrical tank heater, stainless steel pump and impeller and auto-timer, stainless steel vent hoods with vent stack and locking damper, table limit switch and vent for control feature, single point electrical connection, scoop drains, Hobart Corporation, Model CRS-110A, or approved equal.

104a. BOOSTER HEATER:

The booster heater shall be an electric heated unit. The booster heater shall be installed with the rear facing the dishwasher, Item #104. The booster heater shall have a stainless steel front panel, sides and rear and a stainless steel base mounted on 152 mm high legs and adjustable feet. The booster heater shall be capable of boosting 1477 LPH of 60 degree C temperature hot water to 82 degree C. The booster heater shall be equipped with a Castone tank, low-water cutoff, temperature/pressure relief valve, cast iron pressure reducing valve, two temperature/pressure gauges, pilot light and on/off switch. The booster heater shall be equipped with the manufacturer's standard equipment. Specifications are based on a Hatee Model #S-39 booster heater, or approved equal.

105. WASTE PULPING EXTRACTOR:

Specification: Commercial, remote waste pulping system, stainless steel construction, two 4 kW belt drive motors, one 5.5 kW return pump, steel discharge chute with limit switch, chemical additive pump, automatic rinse system. Include all valves. Provide a Somat "Som-A-Trol", or approved equal control panel, in a NEMA 4 stainless steel enclosure. Capacity of 108864 kg per second of food service waste mix with a pulp level detector. Somat, Model No. HE-9S, or approved equal. Coordinate with Equipment Item No. 15 and 24.

106. DOLLY:

Specification: Tubular frame, two compartment, 18 gauge stainless steel undercounter dish cart, unheated, 102 mm in diameter, swivel casters,

ServoLift/Eastern Model No. D120-25, or approved equal.

107. DISHWASHER VENT DUCTS:

Specification: Custom fabricated, size and shape as shown on plans and schedule, stainless steel ducts as required for exhaust of Item 104, Hobart Model CRS-110A or approved equal. Verify size with equipment Item No. 104.

108. SINK, SILVER SOAK:

Specification: Commercial, stainless steel, 16 gauge, roller rim top edge, mounted on 127 mm diameter casters, lever handle drain valve, and stainless steel chute. Seco Model 3474, or approved equal.

109. SERVICE SINK (FLOOR MOUNTED):

Specification: Commercial, stainless steel service sink with drain, service faucet, hose, hose hanger, and mop hanger. Advance/Tabco Model 9-OP-28 with Accessories listed, or approved equal.

110. DISHTABLE, CLEAN:

Specification: Size as shown in schedule for stainless steel dishtable with undershelf, Advance/Tabco SS-3012 or approved equal. Coordinate connection with Equipment Item No. 104.

111. CONVEYOR, SOILED TRAY TABLE:

Specification: Custom fabricated, size and shape as shown on plans, schedule and specifications, conveyor to be full (376mm long) rollers RA-28-S angle frame construction with raised stainless steel rollers on approximately 102 mm centers, gravity operated (pitch not to exceed 7 degrees) to transport Dish Racks. Roller assemblies to be RA-36-S Stainless Steel Rollers (with Curved Sections) by Caddy Corporation, or approved equal. Coordinate length and design with plans and adjacent Equipment Item Nos. 103 and 104.

112. SPRAY ASSEMBLY:

Specification: Commercial backsplash mounted with wall bracket, spring action type with gooseneck, T&S Model No. B-133, or approved equal. Mounted to backsplash on Equipment Item No. 103.

113. CLEAN/SANITIZING MACHINE:

Specification: MIL-C-43949, Type I (portable), 3450 kPa at 0.19 liters per second with spray and nozzle, 7620 mm long high-pressure hose with quick-disconnect, stainless steel, trigger operated wand control, automatic high temperature safety switch, automatic low water safety switch, Hurricorp/Alco "Revised" Model No. 551, or approved equal.

114. DISPENSER, BOWL WITH COVER:

Specification: Commercial, adjustable dish dolly for transport and storage of multiple size dishware, two adjustable adapters, base and center post of 0.100 aluminum, reinforced base, plastic coated corner posts and dividers mobile 127 mm high swivel casters, with corner bumpers, 200-pound load capacity, vinyl dust cover, Crescor Model 501-D or approved equal.

## 115. WALL SHELF:

Specification: Commercial, stainless steel tubular design with solid end brackets. Mounted with base at 508 mm above deck of Equipment Item No. 103. Model DT-6R-04 by Advance Tabco, Inc. or approved equal.

## 116. OPEN:

## 117. DISPENSER; TRAY:

Specification: MIL-D-40631, Type III, (tray dispenser, unheated), Design C (Cantilevered Carrier), Size 3 (14" x 18" tray), Model A (mobile, casters), 100 tray capacity, with one piece wrap-around non-marking vinyl bumper, and stainless steel cylinders. Servolift/Eastern Corporation, Model TCA-ST-0SW8 with Optional Items as listed, or approved equal.

## 118. BREAD RACK:

Specification: Leased item owned by bread company.

## 119. PROOFING CABINET:

Specification: Commercial, formed and welded aluminum cabinet with aluminum sides for 36 removable pans at 38 mm on centers, 1,000 W heater, switch and pilot light, insulated electric cabinet on 127 mm diameter casters. Provide 20 pans, Crescor, Model No. 120-1836B, or approved equal.

## 120. REFRIGERATOR DISPLAY:

Specification: CFC free, stainless steel interior bottom, vinyl coated adjustable wire shelves, self-closing doors, fluorescent interior lighting, triple pane thermal glass doors, and 10 mil white vinyl laminate exterior finish, 28 Cubic Foot Capacity, and 2700 mm cord. Based on True Food Service Equipment, INC. Model GDM-4C, or approved equal.

## 121. OPEN

## 122. CHUTE HOT SANDWICH: HOT FOOD CHUTE, W/SLANT SHELVES:

Specification: Two-tier hot food merchandiser with EZ-insert heat tubes, insulated heat cable base, adjustable heat controls for all levels, pilot lights, bright incandescent illumination with on/off switch, removable sliding glass doors on cook side, removable front and end glass, adjustable legs, 6-foot cord set, sliding front doors and full sized stainless steel pans. Based on Welbilt Corporation, Model 1220-5-6P, or approved equal.

## 123. PIZZA WARMER:

Specification: Four-tier hot food merchandiser with one door, tempered glass sides, incandescent lighting, pan racks, 460 mm perforated pizza pans, and 1000 mm cord. Based on Hatco Flav-R-Savor, Model FST-1X, or approved equal.

## 124. CHEEZE WARMER:

Specification: 10.4 liter warmer with heated pump and stainless steel insert. Based on Hubert Model 23475.

## 125. NACHOS WARMER:

Specification: Hot food merchandiser built of stainless steel and aluminum with tempered glass sides and two doors, incandescent lighting, and 1000 mm cord. Based on Hatco Flav-R-Savor, Model FST-MN, or approved equal.

## 126 . MICROWAVE OVEN:

Specification: Interior and exterior constructed of stainless steel with see through window in side swing door. One cubic foot capacity. Controls located on oven front; allows for programmed, automatic and manual operation. Six memory pads for six different cooking programs. Thirty minute dial timer for manual operation. Based on Hobart Corporation, Model HM1000, or approved equal.

## 126a. COUNTER STAND, W/ TRAY SLIDE:

Specification: Custom fabricated, 14 gauge, 304 stainless steel counter size and shape as shown on plans, schedule and specifications with 18 gauge undershelf, stainless steel brackets for electrical outlets as needed for Item Nos. 61, and xxx. Verify size and design for plans and coordinate with Equipment (Item Nos. 64d, 61, 60, and xxx.)

## 126b. COUNTER STAND, W/ TRAY SLIDE:

Specification: Custom fabricated, 14 gauge, 304 stainless steel counter size and shape as shown on plans, schedule and specifications with 18 gauge undershelf, stainless steel brackets for electrical outlets as needed. Verify size and design for plans and coordinate with Equipment (Item No. 64e.)

## 126c. COUNTER STAND, W/ TRAY SLIDE:

Specification: Custom fabricated, 14 gauge, 304 stainless steel counter size and shape as shown on plans, schedule and specifications with 18 gauge undershelf, stainless steel brackets for electrical outlets as needed for Item Nos. 127, 124, 125, 126, 122, and 123. Verify size and design for plans and coordinate with Equipment (Item Nos. 64b, 127, 124, 125, 126, 122, and 123.)

## 126d. COUNTER STAND, W/ TRAY SLIDE:

Specification: Custom fabricated, 14 gauge, 304 stainless steel counter size and shape as shown on plans, schedule and specifications with 18 gauge undershelf, stainless steel brackets for electrical outlets as needed. Verify size and design for plans and coordinate with Equipment (Item Nos. 64c, 66a, 67, 70a, 71, 70, 69, and 65.)

## 126e. COUNTER STAND, W/ TRAY SLIDE:

Specification: Custom fabricated, 14 gauge, 304 stainless steel counter size and shape as shown on plans, schedule and specifications with 18 gauge undershelf, stainless steel brackets for electrical outlets as needed for Items No. 90. Verify size and design for plans and coordinate with Equipment (Item Nos. 90 and 64g.)

## 127. DONUT/PASTRY DISPLAY:



Specification: Glass front, ends, back, and hinged doors for maximum visibility with anodized aluminum frame, and with mirror back and top light and shields.

128. HOT DOG ROLLER GRILL:

Specification: Commercial, stainless steel unit with chrome rollers and 27 hot dog capacity, Stan Manufacturing Company, Model 25, with sneeze guard Model No. 25SG, or approved equal.

129. OPEN:

130. OPEN:

130. OPEN:

131. OPEN:

132. Hood, Exhaust: (See Mechanical)

133. OPEN:

134. SALAD BAR (EIGHT PAN) W/SNEEZE GUARD & W TRAY SLIDES:

Specification: Solid oak cabinet with laminated panel insets (color selection as directed), full undercounter storage with working doors on one side, laminated countertop (color selection as directed), concealed castors, three per side, oak and glass sneezeguard with fluorescent lighting, louvers for end ventilation. Matching end cabinet. Based on Yorkraft Incorporated Spectrum Salad/Deli Hot and Cold Station. Undercounter refrigerator.

135. OPEN:

136. CASHIER STATION W/TRAY TWO SLIDES:

Specification: Frame constructed of U-shaped fluted, extruded aluminum tubing, with welded cross members. The top fabricated of 16-gauge type 302 polished stainless steel, turned down 50 mm on edges with all corners welded, ground and polished. Full length aprons of aluminum. Fitted with compartmented cash drawer, equipped with 1200 mm cord set, stainless steel adjustable feet, and full length solid stainless steel ribbed tray slide set (both sides as shown) on stainless steel folding brackets.

136a. CASHIER STATION W/TRAY ONE SLIDE:

Specification: Frame constructed of U-shaped fluted, extruded aluminum tubing, with welded cross members. The top fabricated of 16-gauge type 302 polished stainless steel, turned down 50 mm on edges with all corners welded, ground and polished. Full length aprons of aluminum. Fitted with compartmented cash drawer, equipped with 1200 mm cord set, stainless steel adjustable feet, and full length solid stainless steel ribbed tray slide set (one side as shown) on stainless steel folding brackets. Based on Servolift Eastern Corporation Model 503-1.

137: OPEN:

138: OPEN:

139: OPEN:

140: OPEN:

141: MECHANICAL COLD PAN:

Specification: Self contained removable three pan, pre-charged and wired refrigeration unit of 22 gauge galvanized steel outer case, insulation of 1" on sides and 1 ½" bottom, and inner liner of 18 gauge stainless steel, type 304, grade 18-8 of one-piece welded construction with coved corners. NSF listed, equipped with drain, and hermetically sealed compressor. Based on Atlas Metal Industries, Model No. WCM-3, or approved equal.

142: OPEN VERTICAL MERCHANDISER:

Specification: Commercial unit with three standard tiers of lighted shelving, two-position shelves adjustable in 1 inch increments, perforated interior back wall and top, electric defrost, and 1 inch vinyl front bumper guard. Based on Master-Bilt, Model No. MVM-48R with condensing unit #BHH-010C, or approved equal.

C-1 HAND SINK:

Specification: Commercial, one compartment, faucet and mechanical lever drain, back splash, stainless steel construction, wrist operated controls, splash mounted faucet with gooseneck spout, skirt, p-trap with overflow, basket drain, soap and towel dispenser, and wall brackets. Advance Tabco, Inc. Model 7-PS-85, or approved equal.

C-2 DUNNAGE SHELVES, MOBILE:

Specification: Commercial, stainless steel open wire shelves, top and bottom fixed shelves with three intermediate adjustable shelves, one set of two 5 M casters and one set of two 5 MB casters with brakes. Metro, Super Erecta Dunnage Shelves, Catalogue No. 1848 DRS with four 63PS Posts and four 5 MB Stem Casters, or approved equal.

C-3 OPEN:

C-4 FOOD WARMING CABINET:

Specification: Commercial, two compartment, stainless steel, self-contained, on 152 mm legs. Interior shelving adjustable heavy-duty wire shelves, insulated cabinet body and doors, Traulsen, Model RDH 2-32 WUT, or approved equal.

C-5 WALL-MOUNTED OVERSHELF:

Specification: Commercial, size as shown on plans and schedule, 18 gauge stainless steel solid shelf, based on Duke Model MSD-24-24.

C-6 CONVEYOR TOASTER:

Specification: Commercial, Type I, Size 3, (960 slices per hour) conveyor type, 5 kW heating element, Hatco, Model TK-100, or approved equal. Coordinate with Equipment Item No. C-7.

C-7 TABLE/EQUIPMENT STAND:

Specification: Commercial, stainless steel wing table, with 18 pan storage capacity under the top, two adjustable 20 gauge wings each side, Lakeside Manufacturing, Inc., Model 110, or approved equal. Coordinate with Equipment Item No. C-6.

C-8 EQUIPMENT STAND:

Specification: Custom fabricated, size and shape as shown on plans and schedule, 14 gauge stainless steel top, 18 gauge stainless steel undershelf adjacent to Equipment Item No. C-14, and fixed legs. Coordinate design and size with Equipment Item No. C-12, C-13, and C-14 located under stand.

C-9 FOOD WARMER:

Specification: Commercial, stainless steel portable unit, thermostatically controlled, with food holding pan and incandescent lights from above pan, provide 360 mm standard clearance above food pan, Hatco, Glo-ray, Model GR-FFBL.

C-10 EXHAUST HOOD:

Specification: Custom fabrication, hood to be size and shape as shown on plans and specifications, stainless steel with automatic grease washdown system, electronically controlled fire damper with manual reset, make-up air plenum, stainless steel enclosure panels to ceiling, fluorescent lights shall be provided from Equipment Item No. 39a. A cut-out of 629 mm by 210 mm is required for the installation of the hood light fixture. Hood to meet NFPA No. 13 and No. 96 requirements. Model AWWP by AVTEC Industries, Inc., series with remote control panel or approved equal. Panels shall be recessed (with mounting flanges) in location as shown in Plan with conduit/piping access through panel's back or top/bottom of CMU cells. No conduit/piping shall be exposed to view. Number of cutouts for light fixtures are indicated in the KITCHEN EQUIPMENT SCHEDULE on the drawings.

C-11 FIRE SUPPRESSION SYSTEM:

Specification: Commercial, wet chemical system installed in accordance with manufacturer's recommendations and in compliance with NFPA Bulletin No. 96. System to provide duct and plenum protection to Equipment Item No. C-10, exhaust hood and surface protection located under the hood. Locate chemical cylinder as required and install piping to hood in a totally concealed manner. Exposed piping/fittings in exhaust hood to be chrome plated or sleeved with stainless steel tubing. Remote manual release to be located under cylinder. Ansul Fire Protection, Model R-102, or approved equal system. Stainless steel tank enclosure and manual pull station shall be recessed (with mounting flanges) in location as shown in Plan, with conduit/piping access through panel's back or top of CMU cells. No conduit/piping shall be exposed to view.

C-12 DEEP FAT FRYER:

Specification: Commercial, stainless steel, countertop model, two wire baskets, adjustable legs, front oil drain, Keating of Chicago, Inc., Model 10x11 CMG Electric, or approved equal. Coordinate with Equipment Item No. C-8.

C-13 GRIDDLE:

Specification: Commercial, electric griddle, Keating, Model 48 X 30 Electric Griddle, or approved equal. Griddle plate of high carbon  $\frac{3}{4}$ " steel, having a drain trough and perimeter installed in a stainless steel cabinet equipped with electric elements. Coordinate with Equipment Item No. C-8.

C-14 UNDERCOUNTER REFRIGERATOR:

Specification: Commercial, refrigerator, mechanical, commercial, self-contained (short cook top), electric, .3 cubic meters with 152 mm legs, stainless steel, cord and plug, Traulsen Model UL1HT, or approved equal.

C-15 MICROWAVE:

Specification: Commercial, microwave, 1100 watts cooking power level with programmable touch pad controls, Amana, Model RFS11MP2, or approved equal. Coordinate with Equipment Item No. C-28.

C-16 FRONT COUNTER:

Specification: Commercial enclosed work table, 14 gauge stainless steel top with intermediate shelf of 18 gauge stainless steel Type 304. Model EB-SS-304 by Advance Tabco, Inc. or approved equal. Coordinate with Equipment Item No. C-8, C-17, C-23, C-27, and C-32.

C-17 SANDWICH REFRIGERATOR:

Specification: Commercial, self-contained refrigerated base with salad top unit (4.6 cubic feet storage capacity) with bumpers and casters. Top shall be one-piece 16 gauge stainless steel with integral 76mm sloped nosing on front and 152 mm high by 51 mm thick backsplash on rear. Each top end shall have one 12 gauge spline bar with alignment dowels for joining matching equipment. Top shall be supplied with one die-stamped raised rim opening for use with three 1/4 size pans, three 1/3 size pans. Opening to be supplied with removable 18 gauge stainless steel cover. Top to be insulated with 76 mm high-density insulation. One 13 mm thick by 254 mm wide composition cutting board shall be mounted on top. Cabinet interior shall be 22 gauge stainless steel back and bottom. Exterior back and bottom shall be 18 gauge stainless steel. Hinged door shall be constructed with ABS interior liner and 22 gauge stainless steel exterior front. Unit shall be furnished with one epoxy-coated wire shelf and designed to maintain 36 degree to 40 degree F. Housing front to be fitted with 18 gauge stainless steel louvered panel. Delfield, Model No. V18436-28, or approved equal. Mount Equipment Item No. C-32 to front face.

C-17a HEATED SERVING UNIT (2-WELLS):

Specification: Commercial, mobile heated serving unit with end frame assembly constructed from 12 gauge aluminized steel, 16 gauge aluminized steel channel posts and lateral braces. Full front panel, end panels, control panel and all other exposed surfaces constructed of 18 gauge polished stainless steel. Top shall be 16 gauge polished stainless steel reinforced with 14 gauge channels. Provide recessed mounted control panels. Two insulated (high density fiberglass) heated wells are deep drawn stainless steel. Each well shall be 305 mm by 508mm by 165 mm deep with coved corners. Each well is thermostatically controlled between 80 and 200 degrees F on front face of unit. A signal light indicates each wells temperature cycling. Provide four 127 mm diameter heavy duty

casters, two with brakes. Model CC-232 by Carter-Hoffman Corporation or approved equal. Mount Equipment Item No. C-32 to front face.

C-18 HOT DOG COUNTER:

Specification: Commercial, enclosed work table, 14 gauge stainless steel top with intermediate shelf of 18 gauge stainless steel type 430 with fixed legs. "Modified" Model EB-SS-304 by Advance Tabco, Incorporated or approved equal. Length ( "x" dimension in Schedule) shall be modified. Mount Equipment Item No. C-32 to front face. Provide stainless steel brackets with cut-outs for light switch with Equipment Item No. C-20 and for an electric outlet.

C-19 HOT DOG ROLLER GRILL:

Specification: Commercial, stainless steel unit with chrome rollers and 27 hot dog capacity, Stan Manufacturing Company, Model 25, with sneeze guard Model No. 25SG, or approved equal.

C-20 BREATH PROTECTOR:

Specification: Custom fabricated, size and shape as shown on plans, schedule, and specifications, with fluorescent lights, based on Atlas Metal Industries, Model PRC, or approved equal. Modify length as required. Mount onto Equipment Item No. C-16 and C-18, spanning C-17, C-17a and C-19. Switch for light shall be mounted in cut-out on stainless steel bracket in C-18.

C-21 TRAY DISPENSER:

Specification: MIL-D-40631, Type III, tray dispenser, unheated, Design C (Cantilevered Carrier), Size 3, 356 mm by 452 mm (14-inch by 18-inch tray), Model A (mobile, casters), 100-tray capacity, with one-piece wrap-around, non-marking vinyl bumper, and stainless steel cylinders. Servolift/Eastern Corporation, Model TCA-ST-0SW8 with Optional Items as listed, or approved equal.

C-22 DISPLAY REFRIGERATOR:

Specification: Commercial, stainless steel exterior, self-contained, drop-in refrigerated display case, two removable self-closing 130 mm thick thermopane glass with center gaskets, four adjustable epoxy coated wire shelves inside display cabinet, machine compartment contains condensing unit with evaporation and electrical connections, Derfield, Model 5248-S-24, or approved equal. Mount into cut-out of Equipment Item No. C-27.

C-23 CUP/LID DISPENSER:

Specification: Commercial, stainless steel dispenser, four gravity fed cup storage tubes, adjustable to accommodate various size cups, Servend, Model No. CD4A-C, or approved equal.

C-24 ICE MACHINE/DISPENSER:

Specification: Commercial, countertop, manual load with automatic dispenser head, 150-pound storage capacity, stainless steel extension, Servend International, Model No. M-150, or approved equal. Provide 20 mm drain line to floor sink.

## C-24A SODA DISPENSER:

Specification: Commercial, post mix beverage dispenser with five electric valves, integral carbonator 1/4 h.p., and standard one-piece removable drip pan, IMI Cornelius, Inc., Model No. 417405 Venture, or approved equal. Contracting Officer Representative and Hunter AFF personnel shall specify franchise and flavor identification before installation.

## C-25 COFFEE URN (56.78 LITER):

Specification: Commercial, automatic single tank coffee brewer with dispenser, constructed of heavy gauge stainless steel with stainless steel filter basket, brews up to 56.78 liters per hour, American Beverage Systems, Model 8113, Space Saver I, Dual Wall Insulated or approved equal.

## C-26 RACK, CONDIMENT PACKS:

Specification: Commercial, rack and bins for storage of individual packets of condiments, nine bin capacity, Cambro Manufacturing Company, Model 9R9, or approved equal.

## C-27 BEVERAGE COUNTER WITH TROUGH

Specification: Custom fabricated, size and shape as shown on plans, schedule, and specifications, 14 gauge stainless steel top with integral drain trough, 18 gauge undershelf, and 18 gauge front with six hinged 18 gauge stainless steel doors of equal width under tray slide brackets as shown in drawings. Coordinate with adjacent equipment items. Provide cut-out for mounting of Equipment Item C-22. Provide hole cut-out in countertop for Equipment Item No. C-24 and C-24a lines. Verify length ("x" dimension) with Equipment Item No. C-8 and C-16 before fabrication. Mount Equipment Item No. C-32 to front face.

## C-28 WRAPPING STATION:

Specification: Custom fabricated, size and shape as shown on plans, schedule and specifications, 14 gauge stainless steel top and shelf, two-18 gauge undershelves, 18 gauge front, sides, and back with four hinged 18 gauge stainless steel doors of equal width on front face as shown in drawings, 152 mm stainless steel legs with adjustable bullet feet. Provide 14 gauge stainless steel backguard with shelves. Provide stainless steel bracket with cut-out for electrical outlet needed for Equipment Item No. C-15. Provide hole in countertop for Equipment Item No. C-15.

## C-29 OVERSHELF:

Specification: Custom fabricated, size and shape as shown on plans and schedule, 18 gauge stainless steel solid shelf, based on Duke Model MSD-2424 or approved equal.

## C-30 REACH-IN REFRIGERATOR:

Specification: Commercial, refrigerator, mechanical, commercial, self-contained (reach-in), electric, 45 cubic feet with 152 mm legs, stainless steel, Traulsen Model RHT 2-32WUT, or approved equal.

## C-31 REACH-IN FROZEN FOOD CABINET

Specification: Commercial, two section, 48.9 cubic feet capacity, stainless steel exterior and interior, full height doors, four adjustable stainless steel shelves per section, doors to be hinged as shown on plans, lights, fan, defrost heater, Hobart Model QSF2 or approved equal.

C-32 TRAY SLIDE:

Specification: Custom fabricated, tray slide to accommodate 356 mm by 452 mm tray. Coordinate design and layout with plans and specifications. "L" shape plan unit shall be mounted to face of Equipment Item No. C-16, C-17, C-17a, C-18, and C-27.

C-33 REFRIGERATOR (.7 CU-M):

Specification: Commercial, refrigerator, mechanical, commercial, self-contained (reach-in), electric, .7 cubic meters with 152 mm legs, stainless steel, cord and plug, Traulsen Model RHT-1-32 WUT, or approved equal.

C-34 CASHIER STATION W/TRAY TWO SLIDES:

Specification: Frame constructed of U-shaped fluted, extruded aluminum tubing, with welded cross members. The top fabricated of 16-gauge type 302 polished stainless steel, turned down 50 mm on edges with all corners welded, ground and polished. Full length aprons of aluminum. Fitted with compartmented cash drawer, equipped with 1200 mm cord set, stainless steel adjustable feet, and full length solid stainless steel ribbed tray slide set (both sides as shown) on stainless steel folding brackets.

C-35 OPEN:

C-36 PIZZA WARMER:

Specification: Four-tier hot food merchandiser with one door, tempered glass sides, incandescent lighting, pan racks, 460 mm perforated pizza pans, and 1000 mm cord. Based on Hatco Flav-R-Savor, Model FST-1X, or approved equal.

C-37 PASTRY DISPLAY:

Specification: Glass front, ends, back, and hinged doors for maximum visibility with anodized aluminum frame, and with mirror back and top light and shields.

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SECTION 12320

CABINETS AND COUNTERTOPS

05/98

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CEGS-12320 (May 1998)

SECTION 12320

CABINETS AND COUNTERTOPS

05/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.9 (1994) Cabinet Hardware

KITCHEN CABINET MANUFACTURERS ASSOCIATION (KCMA)

KCMA ANSI/KCMA A161.1 (1995) Performance & Construction  
Standards for Kitchen and Vanity Cabinets

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (1995) High-Pressure Decorative Laminates

1.2 DESIGN

Cabinets shall be wood, factory-fabricated and finished in the manufacturer's standard sizes and finishes of the type, design, and configuration indicated. Cabinets shall be constructed as specified and shall meet the requirements of KCMA ANSI/KCMA A161.1. Wall and base cabinet assemblies shall consist of individual units joined into continuous sections. Fastenings shall be accomplished to permit removal and replacement of individual units without affecting the remainder of the installation. Counters shall be provided with watertight sink rim when indicated. Drawers shall be removable and shall be equipped with position stops to avoid accidental complete withdrawals. Shelves shall be fixed or adjustable as indicated.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Cabinets and Countertops; FIO.

Manufacturer's printed data, catalog cuts, installation and cleaning

instructions.

#### SD-04 Drawings

Cabinets and Countertops; FIO.

Drawings showing each type of cabinet and related item, and clearly indicating the complete plan, location, and elevations of the cabinets and accessories and pertinent details of construction, fabrication, and attachments.

#### SD-09 Reports

Cabinets and Countertops; FIO.

Test reports certifying that all cabinets comply with the requirements of KCMA ANSI/KCMA A161.1. Tests shall be conducted by independent laboratories approved by KCMA. KCMA certification seals affixed to the cabinets will be accepted in lieu of certified test reports.

#### SD-14 Samples

Cabinets and Countertops; FIO.

In lieu of individual samples, complete minimum size cabinets may be furnished as samples. Mock-up units are not acceptable. Samples shall be of sufficient size to show color, pattern, and method of assembly.

- a. Countertop and backsplash - One section, containing both.
- b. Door and drawer front - One of each, with hardware mounted.
- c. Countertop color samples approximately 50 x 75 mm size.
- d. Stain/color samples approximately 50 x 75 mm size.

### 1.4 DELIVERY AND STORAGE

Cabinets shall be delivered to the jobsite wrapped in a protective covering. Cabinets shall be stored in accordance with manufacturer's recommendations in an adequately ventilated, dry location that is free of dust, water, or other contaminants and in a manner to permit access for inspection and handling. Cabinets shall be handled carefully to prevent damage to the surfaces. Damaged items that cannot be restored to like-new condition shall be replaced.

## PART 2 PRODUCTS

### 2.1 CABINETS

Cabinets shall be constructed of veneer core plywood. Particle board core plywood shall not be permitted. Wall and base cabinets shall be of the same construction and same outside appearance. Door and drawer design shall be solid flush face with hardwood edges from vendors' standard styles. Shelves shall be fixed or fully adjustable as indicated. Adjustable shelves shall be capable of adjusting on approximately 75 mm increments. Shelves shall be supported by self-locking clips or wood dowels. Dowels shall be approximately 8 mm in diameter by 40 mm long. Dowels shall be inserted into borings for the shelf adjustments. Shelves

shall be minimum 13 mm thick plywood. Drawer fronts shall be hardwood plywood to match cabinet door construction.

#### 2.1.1 Frame Type Cabinets

The cabinets shall be constructed with frame fronts and solid ends, or frame construction throughout. Frame members shall be 19 mm thick by 38 mm wide; kiln-dried hardwood, glued together, and shall be either mortised and tenoned, dovetailed or doweled, nailed, stapled or screwed. Top and bottom corners shall be braced with either hardwood blocks that are glued together with water resistant glue and nailed in place, or metal or plastic corner braces. Backs of wall cabinets shall be 3 mm thick plywood, tempered hardboard or 9 mm thick. Backs of base and tall cabinets shall be 9 mm thick hardwood. Bottoms of cabinets shall be minimum 9 mm thick plywood good grade and shall be braced with wood members glued in place. Cabinet ends shall be 16 mm thick hardwood plywood.

### 2.2 COUNTERTOPS AND BACKSPLASH

#### 2.2.1 High-Pressure Laminated Plastic Clad Countertops

Clad countertop and backsplash shall be constructed of 19 mm thick 20 kg density particle board core and shall be post formed cove type or fully formed type. Cove type shall be a single unit with self-edging and plastic laminate coved at the juncture of the countertop and backsplash. Fully formed type or square edge shall be a unit with shaped edges using wood nose molding at counter edge and shall include a separate backsplash. Backsplash shall be not less than 90 mm high. Edging and trim shall consist of plastic laminate cut and fitted to all exposed edges. End splashes constructed of 19 mm 20 kg density particle board core. Continuous sheets of longest lengths practicable shall be provided. Joints in surface sheeting shall be tight and flush and held to a practicable minimum. When the countertop and backsplash are two separate units, GP50 plastic laminate shall be used. When the countertop and backsplash are one unit, PF42 plastic laminate shall be used. Plastic laminate shall conform to the requirements of NEMA LD 3 and plastic laminate adhesive shall be contact type applied to both surfaces. For fully formed and cove type countertops, the post-forming plastic laminate shall not be bent to a radius smaller than the limit recommended by the plastic manufacturer.

### 2.3 Sink/Lavatory Rims

Sink/lavatory rims shall be of the corrosion resistant steel clamping type, sized to the sink, and a standard product of a manufacturer regularly producing this type of equipment.

### 2.4 FINISH

#### 2.4.1 Cabinet Finish

Cabinets shall be provided with a factory-applied durable finish in accordance with KCMA ANSI/KCMA A161.1 requirements and of a type standard with the manufacturer. Exposed exterior surfaces shall be high-pressure laminate finish.

#### 2.4.2 Melamine Laminated Interior Cabinet Finish

Particle board cabinet backs shall be finished with a melamine laminate on the exposed side. Particle board shelves shall be covered on both sides

with a laminated melamine finish. Melamine laminate shall conform to the requirements of NEMA LD 3 and laminate adhesive shall be contact type applied to both surfaces.

#### 2.4.3 Backer Sheets

Backer Sheets of high pressure plastic laminate, shall conform to NEMA LD 3, Grade BK20 and shall be applied to the underside of all core material.

#### 2.5 HARDWARE

Hardware shall conform to BHMA A156.9, shall be suitable for kitchen cabinet use, and shall include all miscellaneous hardware for a complete installation. Door hinges shall be self-closing type. Drawer runners shall have nylon rollers standard with the manufacturer.

#### 2.6 COLOR, TEXTURE, AND PATTERN

Design, color, and finish shall be as specified in Section 09000 BUILDING COLOR AND FINISH SCHEDULE.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Cabinets shall be installed level, plumb, and true to line, and shall be attached to the walls or floors with suitable devices to securely anchor each unit. Countertops, accessories, and hardware shall be installed as indicated. Installation shall be in accordance with the manufacturer's approved printed instructions. The inner edge of sink cut-outs in laminated plastic tops shall be painted with a coat of semigloss enamel paint and sink flanges shall be set in a bed of sealant. Closer and filler strips and finish moldings shall be provided as required. Prior to final acceptance, doors shall be aligned, and hardware shall be adjusted.

#### 3.2 CLEANING

Cabinet and countertop surfaces shall be cleaned in accordance with manufacturer's instructions.

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SECTION 12490

WINDOW TREATMENT

**01/98**

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CEGS-12490 (January 1998)

SECTION 12490

WINDOW TREATMENT

01/98

PART 1 WORK DESCRIPTION

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

FEDERAL SPECIFICATIONS (FS)

FS AA-V-00200

(Rev B) Venetian Blinds

1.2 GENERAL

Window treatment shall be provided, complete with necessary brackets, fittings, and hardware. Each window treatment type shall be a complete unit provided in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Equipment shall be mounted and operated as indicated. Windows to receive a treatment shall be completely covered. The Contractor shall take measurements at the building and shall be responsible for the proper fitting and hanging of the equipment.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Window Treatments and Hardware; FIO.

Manufacturer's data composed of catalog cuts, brochures, product information, and maintenance instructions.

SD-04 Drawings

Window Treatments and Hardware; FIO.

Drawings showing fabrication and installation details. Drawings shall show layout and locations of track, direction of draw, mounting heights, and details.

SD-14 Samples

Window Treatments and Hardware; FIO.

Three samples of each type and color of window treatment. Blind slats or shall be 150 mm in length for each color. Track shall be 150 mm in length.

Shade material shall be minimum 150 x 150 mm in size.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Components shall be delivered to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Components shall be stored in a dry location that is adequately ventilated and free from dust, water, or other contaminants and shall have easy access for inspection and handling. Materials shall be stored flat in a clean dry area with temperature maintained above 10 degrees C.

#### 1.5 FIELD MEASUREMENTS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

#### 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

### PART 2 PRODUCTS

#### 2.1 WINDOW BLINDS

Each blind, including hardware, accessory items, mounting brackets and fastenings, shall be provided as a complete unit produced by one manufacturer. All parts shall be one color unless otherwise shown, and match the color of the blind slat. Steel features shall be treated for corrosion resistance.

##### 2.1.1 Horizontal Blinds

Horizontal blinds shall conform to FS AA-V-00200, Type II (25 mm (1 inch) slats), except as modified below. Blind units shall be capable of nominally 180 degree partial tilting operation and full-height raising. Blinds shall be inside mount as shown.

##### 2.1.1.1 Head Channel and Slats

Head channel shall be steel or aluminum nominal 0.61 mm for Type II. Slats shall be aluminum, not less than 0.203 mm thick, and of sufficient strength to prevent sag or bow in the finished blind. A sufficient amount of slats shall be provided to assure proper control, uniform spacing, and adequate overlap.

##### 2.1.1.2 Controls

The slats shall be tilted by a transparent tilting wand, hung vertically by its own weight, and shall swivel for easy operation. The tilter control shall be of enclosed construction. Moving parts and mechanical drive shall be made of compatible materials which do not require lubrication during normal expected life. The tilter shall tilt the slats to any desired angle and hold them at that angle so that any vibration or movement of ladders and slats will not drive the tilter and change the angle of slats. A mechanism shall be included to prevent over tightening. The wand shall be of sufficient length to reach to within 1500 mm of the floor.

2.1.1.3 Intermediate Brackets

Intermediate brackets shall be provided for installation of blinds over 1200 mm wide and shall be installed as recommended by the manufacturer.

2.1.1.4 Hold-Down Brackets

Universal type hold-down brackets for sill or jamb mount shall be provided.

2.2 OMITTED

2.3 COLOR

Color shall be in accordance with Section 09000 BUILDING COLOR AND FINISH SCHEDULE.

PART 3 EXECUTION

3.1 WINDOW TREATMENT PLACEMENT SCHEDULE

Window covering shall be provided as indicated on drawings.

3.2 INSTALLATION

Installation shall be in accordance with the approved detail drawings and manufacturer's installation instructions. Units shall be level, plumb, secure, and at proper height and location relative to window units. The Contractor shall furnish and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Installation shall not be initiated until completion of room painting and finishing operations. Upon completion of the installation, window treatments shall be adjusted for form and appearance, shall be in proper operating condition, and shall be free from damage or blemishes. Damaged units shall be repaired or replaced by the Contractor as directed by the Contracting Officer.

-- End of Section --



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SECTION 13080

SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT

04/99

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CEGS-13080 (April 1999)

## SECTION 13080

## SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT

**04/99**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997a) Carbon Structural Steel
ASTM A 53	(1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 325M	(1993) High-Strength Bolts for Structural Steel Joints (Metric)
ASTM A 500	(1996) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 572/A 572M	(1997) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 603	(1994) Zinc-Coated Steel Structural Wire Rope
ASTM A 653/A 653M	(1997) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM E 488	(1996) Strength of Anchors in Concrete and Masonry Elements

## ASME INTERNATIONAL (ASME)

ASME B18.2.1	(1996) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 1993) Square and Hex Nuts (Inch Series)

## COE TECHNICAL INSTRUCTIONS (TI)

TI 809-04	(1998) Seismic Design for Buildings
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## 1.2 SYSTEM DESCRIPTION

### 1.2.1 General Requirements

The requirements for seismic protection measures described in this section shall be applied to the mechanical equipment and systems outlined in Section 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT, the electrical equipment and systems outlined in Section 16070 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT, and the miscellaneous equipment and systems listed below. Seismic protection requirements shall be in accordance with TI 809-04 and additional data furnished by the Contracting Officer, and shall be provided in addition to any other requirements called for in other sections of these specifications. The design for seismic protection shall be based on a Seismic Use Group I building occupancy and on site response coefficients for  $S_{MS} = 0.12$  and  $S_{M1} = 0.04$ . Resistance to lateral forces induced by earthquakes shall be accomplished without consideration of friction resulting from gravity loads. The basic force formulas, for Ground Motions A and B in Chapter 3 of TI 809-04, use the design spectral response acceleration parameters for the performance objective of the building, not for equipment in the building; therefore, corresponding adjustments to the formulas shall be required.

### 1.2.2 Miscellaneous Equipment and Systems

The bracing for the following miscellaneous equipment and systems shall be developed by the Contractor in accordance with the requirements of this specification:

Storage Racks

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Bracing; GA|F. Equipment Requirements; GA|F.

Copies of the design calculations with the detail drawings. Calculations shall be stamped by a registered engineer and shall show the resultant loading from the equipment supports and braces. These loads will be compared to design loads by the engineer-of-record to insure the adequacy of the structural members.

SD-04 Drawings

Bracing; GA|F. Resilient Vibration Isolation Devices; GA|F. Equipment Requirements; GA|F.

Detail drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction. For equipment and systems in buildings that have a performance objective higher than life-safety, the drawings shall be

stamped by the registered engineer who stamps the calculations required above.

#### 1.4 EQUIPMENT REQUIREMENTS

##### 1.4.1 Rigidly Mounted Equipment

The following specific items of equipment: kitchen equipment in Dining Facility to be furnished under this contract shall be constructed and assembled to withstand the seismic forces specified in TI 809-04, Chapter 10. For any rigid equipment which is rigidly attached on both sides of a building expansion joint, flexible joints for piping, electrical conduit, etc., that are capable of accommodating displacements equal to the full width of the joint in both orthogonal directions, shall be provided.

### PART 2 PRODUCTS

#### 2.1 BOLTS AND NUTS

Squarehead and hexhead bolts, and heavy hexagon nuts, ASME B18.2.1, ASME B18.2.2, or ASTM A 325M for bolts and nuts. Bolts and nuts used underground and/or exposed to weather shall be galvanized in accordance with ASTM A 153/A 153M.

#### 2.2 SWAY BRACING

Material used for members listed in this section and on the drawings, shall be structural steel conforming with the following:

- a. Plates, rods, and rolled shapes, ASTM A 36/A 36M. If the Contractor does the design, both ASTM A 36/A 36M and ASTM A 572/A 572M, grade 503 will be allowed.
- b. Wire rope, ASTM A 603.
- c. Tubes, ASTM A 500, Grade B.
- d. Pipes, ASTM A 53, Type E or S, Grade B.
- e. Light gauge angles, less than 6 mm thickness, ASTM A 653/A 653M.

### PART 3 EXECUTION

#### 3.1 BRACING

Bracing shall conform to the arrangements shown. Trapeze-type hanger shall be secured with not less than two 13 mm bolts.

#### 3.2 BUILDING DRIFT

Sway braces for a piping run shall not be attached to two dissimilar structural elements of a building that may respond differentially during an earthquake unless a flexible joint is provided.

#### 3.3 ANCHOR BOLTS

##### 3.3.1 Cast-In-Place

Floor or pad mounted equipment shall use cast-in-place anchor bolts, except as specified below. One nut shall be provided on each bolt. Anchor bolts shall conform to ASTM A 307. Anchor bolts shall have an embedded straight length equal to at least 12 times nominal diameter of the bolt. Anchor bolts that exceed the normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths.

### 3.3.2 Expansion or Chemically Bonded Anchors

Expansion or chemically bonded anchors shall not be used unless test data in accordance with ASTM E 488 has been provided to verify the adequacy of the specific anchor and application. Expansion or chemically bonded anchors shall not be used to resist pull-out in overhead and wall installations if the adhesive is manufactured with temperature sensitive epoxies and the location is accessible to a building fire. Expansion and chemically bonded anchors shall be installed in accordance with the manufacturer's recommendations. The allowable forces shall be adjusted for the spacing between anchor bolts and the distance between the anchor bolt and the nearest edge, as specified by the manufacturer.

#### 3.3.2.1 General Testing

Expansion and chemically bonded anchors shall be tested in place after installation. The tests shall occur not more than 24 hours after installation of the anchor and shall be conducted by an independent testing agency; testing shall be performed on random anchor bolts as described below.

#### 3.3.2.2 Torque Wrench Testing

Torque wrench testing shall be done on not less than 50 percent of the total installed expansion anchors and at least one anchor for every piece of equipment containing more than two anchors. The test torque shall equal the minimum required installation torque as required by the bolt manufacturer. Torque wrenches shall be calibrated at the beginning of each day the torque tests are performed. Torque wrenches shall be recalibrated for each bolt diameter whenever tests are run on bolts of various diameters. The applied torque shall be between 20 and 100 percent of wrench capacity. The test torque shall be reached within one half turn of the nut, except for 9 mm sleeve anchors which shall reach their torque by one quarter turn of the nut. If any anchor fails the test, similar anchors not previously tested shall be tested until 20 consecutive anchors pass. Failed anchors shall be retightened and retested to the specified torque; if the anchor still fails the test it shall be replaced.

#### 3.3.2.3 Pullout Testing

Expansion and chemically bonded anchors shall be tested by applying a pullout load using a hydraulic ram attached to the anchor bolt. At least 5 percent of the anchors, but not less than 3 per day shall be tested. The load shall be applied to the anchor without removing the nut; when that is not possible, the nut shall be removed and a threaded coupler shall be installed of the same tightness as the original nut. The test setup shall be checked to verify that the anchor is not restrained from withdrawing by the baseplate, the test fixture, or any other fixtures. The support for the testing apparatus shall be at least 1.5 times the embedment length away from the bolt being tested. Each tested anchor shall be loaded to 1 times the design tension value for the anchor. The anchor shall have no

observable movement at the test load. If any anchor fails the test, similar anchors not previously tested shall be tested until 20 consecutive anchors pass. Failed anchors shall be retightened and retested to the specified load; if the anchor still fails the test it shall be replaced.

### 3.4 RESILIENT VIBRATION ISOLATION DEVICES

Where the need for these devices is determined, based on the magnitude of the design seismic forces, selection of anchor bolts for vibration isolation devices and/or snubbers for equipment base and foundations shall follow the same procedure as in paragraph ANCHOR BOLTS, except that an equipment weight equal to 5 times the actual equipment weight shall be used.

#### 3.4.1 Resilient and Spring-Type Vibration Devices

Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 13 mm.

#### 3.4.2 Multidirectional Seismic Snubbers

Multidirectional seismic snubbers employing elastomeric pads shall be installed on floor- or slab-mounted equipment. These snubbers shall provide 6 mm free vertical and horizontal movement from the static deflection point. Snubber medium shall consist of multiple pads of cotton duct and neoprene or other suitable materials arranged around a flanged steel trunnion so both horizontal and vertical forces are resisted by the snubber medium.

### 3.5 SWAY BRACES FOR PIPING

Transverse sway bracing for steel and copper pipe shall be provided at intervals not to exceed those shown on the drawings. Transverse sway bracing for pipes of materials other than steel and copper shall be provided at intervals not to exceed the hanger spacing as specified in Section 15400 PLUMBING, GENERAL PURPOSE. Bracing shall consist of at least one vertical angle 50 x 50 mm x 16 gauge and one diagonal angle of the same size.

#### 3.5.1 Longitudinal Sway Bracing

Longitudinal sway bracing shall be provided in accordance with Section 15070 SEISMIC CONTROL FOR MECHANICAL EQUIPMENT.

#### 3.5.2 Anchor Rods, Angles, and Bars

Anchor rods, angles, and bars shall be bolted to either pipe clamps or pipe flanges at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified below. Anchor rods, angles, and bars shall not exceed lengths given in the tabulation below.

#### 3.5.3 Maximum Length for Anchor Braces

Type	Size (millimeters)	Maximum Length* (meters)
Angles	38 x 38 x 6	1.5
	50 x 50 x 6	2.0

Type	Size (millimeters)	Maximum Length* (meters)
	64 x 38 x 6	2.5
	75 x 64 x 6	2.5
	75 x 75 x 6	3.0
Rods	91	1.0
	22	1.0
Flat Bars	38 x 6	0.4
	50 x 6	0.4
	50 x 10	0.5
Pipes (40s)	25	2.0
	32	2.8
	40	3.2
	50	4.0

#### 3.5.4 Bolts

Bolts used for attachment of anchors to pipe and structure shall be not less than 13 mm diameter.

### 3.6 EQUIPMENT SWAY BRACING

#### 3.6.1 Suspended Equipment and Light Fixtures

Equipment sway bracing shall be provided for items supported from overhead floor or roof structural systems, including light fixtures. Braces shall consist of angles, rods, wire rope, bars, or pipes arranged as shown and secured at both ends with not less than 13 mm bolts. Sufficient braces shall be provided for equipment to resist a horizontal force equal to 0.062 times the weight of equipment without exceeding safe working stress of bracing components. Details of equipment bracing shall be submitted for acceptance. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45 degrees directed up and radially away from equipment and oriented symmetrically in 90-degree intervals on the horizontal plane, bisecting the angles of each corner of the equipment, provided that supporting members are properly sized to support operating weight of equipment when hangers are inclined at a 45-degree angle.

#### 3.6.2 Floor or Pad Mounted Equipment

##### 3.6.2.1 Shear Resistance

Floor mounted equipment shall be bolted to the floor. Requirements for the number and installation of bolts to resist shear forces shall be in accordance with paragraph ANCHOR BOLTS.

##### 3.6.2.2 Overturning Resistance

The ratio of the overturning moment from seismic forces to the resisting moment due to gravity loads shall be used to determine if overturning forces need to be considered in the sizing of anchor bolts. Calculations shall be provided to verify the adequacy of the anchor bolts for combined shear and overturning.

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## SECTION 13100

LIGHTNING PROTECTION SYSTEM  
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## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C135.30 (1988) Zinc-Coated Ferrous Ground Rods for  
Overhead or Underground Line Construction

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

NFPA 780 (1997) Installation of Lightning  
Protection Systems

## UNDERWRITERS LABORATORIES (UL)

UL 96 (1994; Rev thru Dec 1996) Lightning  
Protection Components

UL 96A (1994) Installation Requirements for  
Lightning Protection Systems

UL 467 (1993; Rev thru Aug 1996) Grounding and  
Bonding Equipment

UL Elec Const Dir (1997) Electrical Construction Materials  
Directory

## 1.2 GENERAL REQUIREMENTS

## 1.2.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work. No departures shall be made without the prior approval of the Contracting Officer.

## 1.2.2 System Requirements

The system furnished under this specification shall consist of the standard products of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest UL approved design. The lightning protection system shall conform to NFPA 70 and NFPA 780, UL 96 and UL 96A, except where requirements in excess thereof are

specified herein.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-04 Drawings

Lightning Protection System; FIO.

Detail drawings consisting of a complete list of material, including manufacturer's descriptive and technical literature, catalog cuts, drawings, and installation instructions. Detail drawings shall demonstrate that the system has been coordinated and will function as a unit. Drawings shall show proposed layout and mounting and relationship to other parts of the work.

#### SD-13 Certificates

Materials and Equipment; FIO.

Where material or equipment is specified to comply with requirements of UL, proof of such compliance. The label of or listing in UL Elec Const Dir will be acceptable evidence. In lieu of the label or listing, a written certificate from an approved nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of Underwriters Laboratories may be submitted. A letter of findings shall be submitted certifying UL inspection of lightning protection systems provided on all new facilities.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 General Requirements

No combination of materials shall be used that form an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, conductors with protective coatings or oversize conductors shall be used. Where a mechanical hazard is involved, the conductor size shall be increased to compensate for the hazard or the conductors shall be protected by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is used, the conductor shall be electrically connected at the upper and lower ends.

#### 2.1.2 Main and Secondary Conductors

Conductors shall be in accordance with NFPA 780 and UL 96 for Class I, Class II, or Class II modified materials as applicable.

##### 2.1.2.1 Copper

Copper conductors used on nonmetallic stacks shall weigh not less than 170

kg per 300 m (375 pounds per thousand feet), and the size of any wire in the cable shall be not less than No. 15 AWG. The thickness of any web or ribbon used on stacks shall be not less than No. 12 AWG. Counterpoise shall be copper conductors not smaller than No. 1/0 AWG.

#### 2.1.2.2 Aluminum

Aluminum shall not contact the earth nor shall it be used in any other manner that will contribute to rapid deterioration of the metal. Appropriate precautions shall be observed at connections with dissimilar metals. Aluminum conductors for bonding and interconnecting metallic bodies to the main cable shall be at least equivalent to strength and cross-sectional area of a No. 4 AWG aluminum wire. When perforated strips are provided, strips that are much wider than solid strips shall be a strip width that is at least twice that of the diameter of the perforations shall be used. Aluminum strip for connecting exposed water pipes shall be not less than No. 12 AWG in thickness and at least 38.1 mm wide.

#### 2.1.3 Air Terminals

Terminals shall be in accordance with UL 96 and NFPA 780. Air terminals more than 600 mm in length shall be supported by a suitable brace, with guides not less than one-half the height of the terminal.

#### 2.1.4 Ground Rods

Rods made of copper-clad steel shall conform to UL 467 and galvanized ferrous rods shall conform to ANSI C135.30. Ground rods shall be not less than 19.1 mm (3/4 inch) in diameter and 3.048 m (10 feet) in length.

#### 2.1.5 Connectors

Clamp-type connectors for splicing conductors shall conform to UL 96, class as applicable, and, Class 2, style and size as required for the installation.

#### 2.1.6 Lightning Protection Components

Lightning protection components, such as bonding plates, air terminal supports, chimney bands, clips, and fasteners shall conform to UL 96, classes as applicable.

### PART 3 EXECUTION

#### 3.1 INTEGRAL SYSTEM

##### 3.1.1 General Requirements

The lightning protection system shall consist of air terminals, roof conductors, down conductors, ground connections, and grounds, electrically interconnected to form the shortest distance to ground. All conductors on the structures shall be exposed except where conductors are in protective sleeves exposed on the outside walls. Secondary conductors shall interconnect with grounded metallic parts within the building. Interconnections made within side-flash distances shall be at or above the level of the grounded metallic parts.

##### 3.1.1.1 Air Terminals

Air terminal design and support shall be in accordance with NFPA 780. Terminals shall be rigidly connected to, and made electrically continuous with, roof conductors by means of pressure connectors or crimped joints of T-shaped malleable metal and connected to the air terminal by a dowel or threaded fitting. Air terminals at the ends of the structure shall be set not more than 600 mm (2 feet) from the ends of the ridge or edges and corners of roofs. Spacing of air terminals 600 mm (2 feet) in height on ridges, parapets, and around the perimeter of buildings with flat roofs shall not exceed 7.5 meters. In specific instances where it is necessary to exceed this spacing, the specified height of air terminals shall be increased not less than 50 mm for each 300 mm of increase over 7.5 meters. On large, flat or gently sloping roofs, as defined in NFPA 780, air terminals shall be placed at points of the intersection of imaginary lines dividing the surface into rectangles having sides not exceeding 15 m in length. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Metal projections and metal parts of buildings, smokestacks, and other metal objects that do not contain hazardous materials and that may be struck but not appreciably damaged by lightning, need not be provided with air terminals. However, these metal objects shall be bonded to the lightning conductor through a metal conductor of the same unit weight per length as the main conductor. Where metal ventilators are installed, air terminals shall be mounted thereon, where practicable. Any air terminal erected by necessity adjacent to a metal ventilator shall be bonded to the ventilator near the top and bottom. Where metal ventilators are installed with air terminals mounted thereon, the air terminal shall not be more than 610 mm away from the farther edge or corner. If the air terminal is farther than this distance, an additional air terminal shall be added in order to meet this requirement. Where metal ventilators are installed with air terminals mounted adjacent, the air terminal shall not be more than 610 mm away from the farther edge or corner. If the air terminal is farther than this distance, an additional air terminal shall be added in order to meet this requirement.

#### 3.1.1.2 Roof Conductors

Roof conductors shall be connected directly to the roof or ridge roll. Sharp bends or turns in conductors shall be avoided. Necessary turns shall have a radius of not less than 203 mm. Conductors shall preserve a downward or horizontal course and shall be rigidly fastened every 900 mm along the roof and down the building to ground. Metal ventilators shall be rigidly connected to the roof conductor at three places. All connections shall be electrically continuous. Roof conductors shall be coursed along the contours of flat roofs, ridges, parapets, and edges; and where necessary, over flat surfaces, in such a way as to join each air terminal to all the rest. Roof conductors surrounding tank tops, decks, flat surfaces, and flat roofs shall be connected to form a closed loop.

#### 3.1.1.3 Down Conductors

Down conductors shall be electrically continuous from air terminals and roof conductors to grounding electrodes. Down conductors shall be run concealed. Each building or structure shall have not less than two down conductors located as widely separated as practicable, at diagonally opposite corners. On rectangular structures having gable, hip, or gambrel roofs more than 35 m long, there shall be at least one additional down conductor for each additional 15 m of length or fraction thereof. On rectangular structures having French, flat, or sawtooth roofs exceeding 75 m

in perimeter, there shall be at least one additional down conductor for each 30 m of perimeter or fraction thereof. On an L- or T-shaped structure, there shall be at least one additional down conductor; on an H-shaped structure, at least two additional down conductors; and on a wing-built structure, at least one additional down conductor for each wing.

On irregularly shaped structures, the total number of down conductors shall be sufficient to make the average distance between them along the perimeter not greater than 30 meters. On structures exceeding 15 m in height, there shall be at least one additional down conductor for each additional 18 m of height or fraction thereof, except that this application shall not cause down conductors to be placed about the perimeter of the structure at intervals of less than 15 meters. Additional down conductors shall be installed when necessary to avoid "dead ends" or branch conductors ending at air terminals, except where the air terminal is on a roof below the main protected level and the "dead end" or branch conductor is less than 5 m in length and maintains a horizontal or downward coursing. Down conductors shall be equally and symmetrically spaced about the perimeter of the structure. Down conductors shall be protected by placing in PVC conduit for a minimum distance of 1800 mm above finished grade level.

#### 3.1.1.4 Interconnection of Metallic Parts

Metal doors, windows, and gutters shall be connected directly to the grounds or down conductors using not smaller than No. 6 copper conductor, or equivalent. Conductors placed where there is probability of unusual wear, mechanical injury, or corrosion shall be of greater electrical capacity than would normally be used, or shall be protected. The ground connection to metal doors and windows shall be by means of mechanical ties under pressure, or equivalent.

#### 3.1.1.5 Ground Connections

Ground connections comprising continuations of down conductors from the structure to the grounding electrode shall securely connect the down conductor and ground in a manner to ensure electrical continuity between the two. All connections shall be of the clamp type. There shall be a ground connection for each down conductor. Metal water pipes and other large underground metallic objects shall be bonded together with all grounding mediums. Ground connections shall be protected from mechanical injury. In making ground connections, advantage shall be taken of all permanently moist places where practicable, although such places shall be avoided if the area is wet with waste water that contains chemical substances, especially those corrosive to metal.

#### 3.1.1.6 Grounding Electrodes

A grounding electrode shall be provided for each down conductor located as shown. A driven ground shall extend into the earth for a distance of not less than 3.0 meters. Ground rods shall be set not less than 900 mm, nor more than 2.5 m, from the structures foundation. The complete installation shall have a total resistance to ground of not more than 25 ohms. Ground rods shall be tested individually prior to connection to the system and the system as a whole shall be tested not less than 24 hours after rainfall. When the resistance of the complete installation exceeds the specified value, the Contracting Officer shall be notified immediately. A counterpoise shall be of No. 1/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 600 mm deep at a distance not less than 900 mm nor more than 2.5 m from the nearest point of the structure.

All connections between ground connectors and grounds or counterpoise, and between counterpoise and grounds shall be electrically continuous.

### 3.1.2 Metal Roofs

Wood-Frame, Wall-Bearing Masonry or Tile Structure with Metallic Roof and Nonmetallic Exterior Walls, or Reinforced Concrete Building with Metallic Roof: Metal roofs which are in the form of sections insulated from each other shall be made electrically continuous by bonding. Air terminals shall be connected to, and made electrically continuous with, the metal roof as well as the roof conductors and down conductors. Ridge cables and roof conductors shall be bonded to the roof at the upper and lower edges of the roof and at intervals not to exceed 30 meters. The down conductors shall be bonded to roof conductors and to the lower edge of the metal roof.

Where the metal of the roof is in small sections, the air terminals and down conductors shall have connections made to at least four of the sections. All connections shall have electrical continuity and have a surface contact of at least 1935 square millimeters (3 square inches).

### 3.1.3 Omitted

### 3.1.4 Steel Frame Building

The steel framework shall be made electrically continuous. Electrical continuity may be provided by bolting, riveting, or welding steel frame, unless a specific method is noted on the drawings. The air terminals shall be connected to the structural steel framework at the ridge. Short runs of conductors shall be used as necessary to join air terminals to the metal framework so that proper placing of air terminals is maintained. Separate down conductors from air terminals to ground connections are not required. Where a grounded metal pipe water system enters the building, the structural steel framework and the water system shall be connected at the point of entrance by a ground connector. Connections to pipes shall be by means of ground clamps with lugs. Connections to structural framework shall be by means of nut and bolt or welding. All connections between columns and ground connections shall be made at the bottom of the steel columns. Ground connections to grounding electrodes or counterpoise shall be run from not less than one-half of all the columns distributed equally around the perimeter of the structure at intervals averaging not more than 18 meters.

### 3.2 OMITTED

### 3.3 OMITTED

### 3.4 INTERCONNECTION OF METAL BODIES

Metal bodies of conductance shall be protected if not within the zone of protection of an air terminal. Metal bodies of conductance having an area of 0.258 square meters (400 square inches) or greater or a volume of 0.0164 cubic meters (1000 cubic inches) or greater shall be bonded to the lightning protection system using main size conductors and a bonding plate having a surface contact area of not less than 1935.5 square millimeters (3 square inches). Provisions shall be made to guard against the corrosive effect of bonding dissimilar metals. Metal bodies of inductance shall be bonded at their closest point to the lightning protection system using secondary bonding conductors and fittings. A metal body that exceeds 1.5 m in any dimension, that is situated wholly within a building, and that does not at any point come within 1.8 m of a lightning conductor or metal connected thereto shall be independently grounded.

3.5 OMITTED

3.6 OMITTED

3.7 OMITTED

3.8 OMITTED

3.9 INSPECTION

The lightning protection system will be inspected by the Contracting Officer to determine conformance with the requirements of this specification. No part of the system shall be concealed until so authorized by the Contracting Officer.

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## SECTION 13110

## CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)

**11/98**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 418	(1995a) Cast and Wrought Galvanic Zinc Anodes
ASTM B 843	(1996) Magnesium Alloy Anodes for Cathodic Protection
ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials

## CODE OF FEDERAL REGULATIONS (CFR)

49 CFR 192	Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards
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## NACE INTERNATIONAL (NACE)

NACE RP0169	(1996) Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0177	(1995) Mitigation of Alternating Current and Lightning Effects on Metallic Piping Systems
NACE RP0188	(1990) Discontinuity (Holiday) Testing of Protective Coatings
NACE RP0190	(1995) External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerged Pipelines and Piping Systems

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA TC 2	(1990) Electrical Polyvinyl Chloride (PVC)
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Tubing (EPT) and Conduit (EPC-40 and EPC-80)

NEMA WC 5 (1992; Rev 1) Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996; Errata 96-4) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 6 (1997) Rigid Metal Conduit

UL 510 (1994; Rev thru Nov 1997) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape

UL 514A (1996; Rev Jul 1998) Metallic Outlet Boxes

## 1.2 GENERAL REQUIREMENTS

The Contractor shall design, furnish and install a complete, operating, sacrificial anode cathodic protection system in complete compliance with NFPA 70, with all applicable Federal, State, and local regulations and with minimum requirements of this contract. Soil resistivity measurements in selected areas are included in the appendix. Additional measurements shall be made by the Contractor as required under paragraph Services of "Corrosion Expert". In addition to the minimum requirements of these specifications, construction of gas pipelines and associated cathodic protection systems, if required, shall be in compliance with 49 CFR 192. The services required include designing, planning, installation, adjusting and testing of a cathodic protection system, using sacrificial anodes for cathodic protection of the exposed metallic water, fire protection, force main and gas lines, valve connectors and lines under the slab or floor foundation. The cathodic protection system shall include anodes, cables, connectors, corrosion protection test stations, and any other equipment required for a complete operating system providing the NACE criteria of protection as specified. Insulators are required whenever needed to insulate the pipes from any other structure. The cathodic protection shall be provided on exposed metallic water, fire protection, force main and gas pipes, valves and connectors.

### 1.2.1 Services of "Corrosion Expert"

The Contractor shall obtain the services of a "corrosion expert" to design the cathodic protection system and to supervise, inspect, and test the installation and performance of the cathodic protection system. "Corrosion expert" refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. Such a person must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or

submerged metallic piping and tank systems, if such certification or licensing includes 5 years experience in corrosion control on underground metallic surfaces of the type under this contract. The "corrosion expert" shall make at least 3 visits to the project site. The first of these visits shall include measuring soil resistivity data in the respective locations as needed, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Once the submittals are approved and the materials delivered, the "corrosion expert" shall design the cathodic protection system and then revisit the site to ensure the Contractor understands installation practices and laying out the components. The third visit shall involve testing the installed cathodic protection systems and training applicable personnel on proper maintenance techniques. The "corrosion expert" shall supervise installation and testing of all cathodic protection.

#### 1.2.2 Cathodic Protection Design

The specified system shall be a complete system with magnesium sacrificial anodes. The proposed system shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolts with reference to a saturated copper-copper sulfate reference cell on the underground components of the piping or other metallic surface. The Contractor shall take resistivity measurements of the soil in the vicinity of the pipes and ground bed sites.

Based upon the measurements taken, the current and voltage shall be required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential shall be obtained over 95 percent of the metallic area. The anode system shall be designed for a life of 25 years of continuous operation.

#### 1.2.3 Isolators

Isolators are required to insulate the pipes from any other structure. Isolators shall be provided with lightning protection and a test station.

#### 1.2.4 Anode and Bond Wires

A minimum of five magnesium anodes with an unpackaged weight of 8 kilograms shall be provided uniform distances along the metallic pipe lines. A minimum of three test stations shall be used for these anodes. These anodes shall be in addition to anodes for the pipe under concrete slab and casing requirements. For each cathodic system, the metallic components and structures to be protected shall be made electrically continuous. This shall be accomplished by installing bond wires between the various structures. Bonding of existing buried structures may also be required to preclude detrimental stray current effects and safety hazards. Provisions shall be included to return stray current to its source without damaging structures intercepting the stray current. The electrical isolation of underground facilities in accordance with acceptable industry practice shall be included under this section. All tests shall be witnessed by the Contracting Officer.

#### 1.2.5 Surge Protection

Approved zinc grounding cells or sealed weatherproof lightning arrestor devices shall be installed across insulated flanges or fittings installed in underground piping. The arrestor shall be gapless, self-healing, solid state type. Zinc anode composition shall conform to ASTM B 418, Type II. Lead wires shall be number 6 AWG copper with high molecular weight

polyethylene (HMWPE) insulation. The zinc grounding cells shall not be prepackaged in backfill but shall be installed as detailed on the drawings. Lightning arrestors or zinc grounding cells are not required for insulated flanges on metallic components used on nonmetallic piping systems.

#### 1.2.6 Summary of Services Required

The scope of services shall include, but shall not be limited to, the following:

- a. Close-interval potential surveys.
- b. Soil resistivity measuring.
- c. Cathodic Protection Systems, design and installation.
- d. System testing.
- e. Casing corrosion control.
- f. Interference testing.
- g. Training.
- h. Operating and maintenance manual.
- i. Insulator testing and bonding testing.
- j. Coating and holiday testing shall be submitted within 45 days of notice to proceed.

#### 1.2.7 Nonmetallic Pipe System

In the event pipe other than metallic pipe is approved and used in lieu of metallic pipe, all metallic components of this pipe system shall be protected with cathodic protection. Detailed drawings of cathodic protection for each component shall be submitted to the Contracting Officer for approval within 45 days after date of receipt of notice to proceed, and before commencement of any work.

##### 1.2.7.1 Coatings

Coatings for metallic components shall be as required for metallic fittings. Protective covering (coating and taping) shall be completed and tested on each metallic component (such as valves, hydrants and fillings). This covering shall be as required for underground metallic pipe. Each test shall be witnessed by the Contracting Officer. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications. The use of nonmetallic pipe does not change other requirements of the specifications. Any deviations due to the use of nonmetallic pipe shall be submitted for approval.

##### 1.2.7.2 Tracer Wire

When a nonmetallic pipe line is used to extend or add to an existing metallic line, an insulated No. 8 AWG copper wire shall be thermit-welded to the existing metallic line and run the length of the new nonmetallic line. This wire shall be used as a locator tracer wire and to maintain continuity to any future extensions of the pipe line.

#### 1.2.8 Tests of Components

A minimum of four tests shall be made at each metallic component in the piping system. Two measurements shall be made directly over the anodes and the other two tests shall be over the outer edge of the component, but at the farthest point from the anodes. Structure and pipes shall be shown with the cathodic protection equipment. All components of the cathodic protection system shall be shown on drawings, showing their relationship to the protected structure or component. A narrative shall describe how the cathodic protection system will work and provide testing at each component.

Components requiring cathodic protection shall include but not be limited to the following:

- a. Pipes under the floor slab or foundations.
- b. PIV.
- c. Shutoff valves.
- d. Metallic pipe extended from aboveground locations.
- e. Each connector or change-of-direction device.
- f. Any metallic pipe component or section.
- g. Backflow preventor.
- h. Culvert.

#### 1.2.9 Drawings

Detailed drawings shall be provided showing location of anodes, insulated fittings, test stations, permanent reference cells, and bonding. Locations shall be referenced to two permanent facilities or mark points.

#### 1.2.10 Electrical Potential Measurements

All potential tests shall be made at a minimum of 3 meter intervals witnessed by the Contracting Officer. Submittals shall identify test locations on separate drawing, showing all metal to be protected and all cathodic protection equipment. Test points equipment and protected metal shall be easily distinguished and identified.

#### 1.2.11 Achievement of Criteria for Protection

All conductors, unless otherwise shown, shall be routed to or through the test stations. Each system provided shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolt potentials with reference to a saturated copper-copper-sulfate reference cell on all underground components of the piping. Based upon the measurements taken, the current and voltage of the anodes should be adjusted as required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential should be obtained over 95 percent of the metallic area. This must be achieved without the "instant off" potential exceeding 1150 millivolts. Testing will be witnessed by the Contracting Officer. Additional anodes shall be provided by the Contractor if required to achieve the minus 850 millivolts "instant off". Although acceptance criteria of the cathodic protection



systems are defined in NACE RP0169, for this project the "instant off" potential of minus 850 millivolts is the only acceptable criteria.

#### 1.2.12 Metallic Components and Typicals

a. Metallic components: As a minimum, each metallic component shall be protected with two magnesium anodes. This number of anodes is required to achieve minus 850 millivolts "instant off" potential on the metallic area and at the same time not provide overvoltage above 1150 millivolts "instant off." As a minimum, the magnesium anode unpackaged weight shall be 7.7 kilograms. The magnesium anodes shall be located on each side of the metallic component and routed through a test station.

b. Fire Hydrants: Fire hydrant pipe components shall have a minimum of two anodes. These magnesium anodes shall have an unpackaged weight of 7.7 kilograms (17 lbs).

c. Pipe Under Concrete Slab: Pipe under concrete slab shall have a minimum of two magnesium anodes. These magnesium anodes shall have an unpackaged weight of 7.7 kilograms. Pipe under concrete slab shall have one permanent reference electrodes located under the slab. One permanent reference electrode shall be located where the pipe enters the concrete slab. All conductors shall be routed to a test station.

d. Valves: Each valve shall be protected with one magnesium anode. The magnesium anode shall have an unpackaged weight of 7.7 kilograms.

e. Metallic Pipe Component or Section: Each section of metallic pipe shall be protected with two magnesium anodes. The magnesium anodes shall have an unpackaged weight of 7.7 kilograms.

f. Connectors or Change-of-Direction Devices: Each change-of-direction device shall be protected with two magnesium anodes. The magnesium anode shall have an unpackaged weight of 7.7 kilograms.

#### 1.2.13 Metallic Component Coating

Coatings for metallic components shall be as required for metallic fittings. This will include fire hydrants, T's, elbows, valves, etc. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Materials and Equipment; GA|F.

Within 30 days after receipt of notice to proceed, an itemized list of equipment and materials including item number, quantity, and manufacturer of each item. The list shall be accompanied by a description of procedures for each type of testing and adjustments, including testing of coating for thickness and holidays. Installation of materials and equipment shall not commence until this submittal is approved.

Spare Parts; GA|F.

Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than 6 months prior to the date of beneficial occupancy. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. One spare anode of each type shall be furnished.

#### SD-04 Drawings

Cathodic Protection System; GA|D.

Six copies of detail drawings consisting of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts, results of system design calculations including soil-resistivity, installation instructions and certified test data stating the maximum recommended anode current output density and the rate of gaseous production if any at that current density. Detail drawings shall contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit. The drawings shall show proposed changes in anode arrangement, anode size and number, anode materials and layout details, conduit size, wire size, mounting details, wiring diagram, method for electrically-isolating each pipe, and any other pertinent information to proper installation and performance of the system.

#### SD-08 Statements

Services of "Corrosion Expert"; GA|F.

Evidence of qualifications of the "corrosion expert."

a. The "corrosion expert's" name and qualifications shall be certified in writing to the Contracting Officer prior to the start of construction.

b. Certification shall be submitted giving the name of the firm, the number of years of experience, and a list of not less than five of the firm's installations 3 or more years old that have been tested and found satisfactory.

#### SD-09 Reports

Tests and Measurements; GA|F.

Test reports in booklet form tabulating all field tests and measurements performed, upon completion and testing of the installed system and including close interval potential survey, casing and interference tests, final system test verifying protection, insulated joint and bond tests, and holiday coating test. A certified test report showing that the connecting method has passed a 120-day laboratory test without failure at the place of connection, wherein the anode is subjected to maximum recommended current output while immersed in a three percent sodium chloride solution.

Cathodic Protection Design; GA|D.

The report shall include pipe-to-soil measurements throughout the affected

area and current measurements for anodes. The following special materials and information are required: taping materials and conductors; zinc grounding cell, installation and testing procedures, and equipment; coating material; system design calculations for anode number, life, and parameters to achieve protective potential; backfill shield material and installation details showing waterproofing; bonding and waterproofing details; insulated resistance wire; exothermic weld equipment and material.

#### SD-13 Certificates

Cathodic Protection System; GA|F.

Proof that the materials and equipment furnished under this section conform to the specified requirements contained in the referenced standards or publications. The label or listing by the specified agency will be acceptable evidence of such compliance.

#### SD-18 Records

Training Course; GA|F.

The proposed Training Course Curriculum (including topics and dates of discussion) indicating that all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions, are to be covered.

#### SD-19 Operation and Maintenance Manuals

Cathodic Protection System; GA|F.

Before final acceptance of the cathodic protection system, six copies of operating manuals outlining the step-by-step procedures required for system startup, operation, adjustment of current flow, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance manual, listing routine maintenance procedures, recommendation for maintenance testing, possible breakdowns and repairs, and troubleshooting guides. The manuals shall include single-line diagrams for the system as installed; instructions in making pipe-to-reference cell and tank-to-reference cell potential measurements and frequency of monitoring; instructions for dielectric connections, interference and sacrificial anode bonds; instructions shall include precautions to ensure safe conditions during repair of pipe or other metallic systems. The instructions shall be neatly bound between permanent covers and titled "Operating and Maintenance Instructions." These instructions shall be submitted for the Contracting Officer's approval. The instructions shall include the following:

a. As-built drawings, to scale of the entire system, showing the locations of the piping, location of all anodes and test stations, locations of all insulating joints, and structure-to-reference cell potentials as measured during the tests required by Paragraph: TESTS AND MEASUREMENTS, of this section.

b. Recommendations for maintenance testing, including instructions in making pipe-to-reference cell potential measurements and frequency of testing.

c. All maintenance and operating instructions and nameplate data shall be in English.

d. Instructions shall include precautions to insure safe conditions during repair of pipe system.

## PART 2 PRODUCTS

### 2.1 MAGNESIUM ANODES

A minimum of two anodes shall be installed on the pipe system. See Paragraph METALLIC COMPONENTS AND TYPICALS for additional anodes under slab.

#### 2.1.1 Anode Composition

Anodes shall be of high-potential magnesium alloy, made of primary magnesium obtained from sea water or brine, and not made from scrap metal. Magnesium anodes shall conform to ASTM B 843 and to the following analysis (in percents) otherwise indicated:

Aluminum, max.	0.010
Manganese, max.	0.50 to 1.30
Zinc	0.05
Silicon, max.	0.05
Copper, max.	0.02
Nickel, max.	0.001
Iron, Max.	0.03
Other impurities, max.	0.05 each or 0.3 max. total
Magnesium	Remainder

The Contractor shall furnish spectrographic analysis on samples from each heat or batch of anodes used on this project.

#### 2.1.2 Dimensions and Weights

Dimensions and weights of anodes shall be approximately as follows:

##### TYPICAL MAGNESIUM ANODE SIZE

(Cross sections may be round, square, or D shaped)

NOMINAL WT. kg.	APPROX. SIZE (mm)	NOMINAL GROSS WT kg PACKAGED IN BACKFILL	NOMINAL PACKAGE DIMENSIONS (mm)
1.4	76 X 76 X 127	3.6	133 X 133 X 203
2.3	76 X 76 X 203	5.9	133 X 133 X 286
4.1	76 X 76 X 356	12.3	133 X 508
5.5	102 X 102 X 305	14.5	191 X 457
7.7	102 X 102 X 432	20.5	191 X 610
14.5	127 X 127 X 521	30.9	216 X 711
22.7	178 X 178 X 406	45.5	254 X 610

#### 2.1.3 Packaged Anodes

Anodes shall be provided in packaged form with the anode surrounded by specially-prepared quick-wetting backfill and contained in a water permeable cloth or paper sack. Anodes shall be centered by means of

spacers in the backfill material. The backfill material shall have the following composition, unless otherwise indicated:

Material	Approximate Percent by Weight
Gypsum	75
Bentonite	20
Sodium Sulphate	5
Total	100

#### 2.1.4 Omitted

#### 2.1.5 Connecting Wire

##### 2.1.5.1 Wire Requirements

Wire shall be No. 12 AWG solid copper wire, not less than 3 meters long, unspliced, complying with NFPA 70, Type TW insulation. Connecting wires for magnesium anodes shall be factory installed with the place or emergence from the anode in a cavity sealed flush with a dielectric sealing compound.

##### 2.1.5.2 Anode Header Cable

Cable for anode header and distribution shall be stranded copper wire with type CP high molecular weight polyethylene, 2.8 mm thick insulation, 600-volt rating, in accordance with NEMA WC 5.

#### 2.2 MISCELLANEOUS MATERIALS

##### 2.2.1 Electrical Wire

Wire shall be No. 12 AWG stranded copper wire with NFPA 70, polyethylene insulation. Polyethylene insulation shall comply with the requirements of ASTM D 1248 and shall be of the following types, classes, and grades:

High-molecular weight polyethylene shall be Type I, Class C, Grade E5.

High-density polyethylene shall be Type III, Class C, Grade E3.

##### 2.2.1.1 Wire Splicing

Connecting wire splicing shall be made with copper compression connectors or exothermic welds, following instructions of the manufacturer. Single split-bolt connections shall not be used. Sheaths for encapsulating electrical wire splices to be buried underground shall fit the insulated wires entering the spliced joints and epoxy potting compound shall be as specified below.

##### 2.2.1.2 Test Wires

Test wires shall be AWG No. 12 stranded copper wire with NFPA 70, Type TW or RHW or polyethylene insulation.

##### 2.2.1.3 Resistance Wire

Resistance wire shall be AWG No. 16 or No. 22 nickel-chromium wire.

##### 2.2.2 Conduit

Rigid galvanized steel conduit and accessories shall conform to UL 6. Non metallic conduit shall conform to NEMA TC 2.

#### 2.2.3 Test Boxes and Junctions Boxes

Boxes shall be outdoor type conforming to UL 514A.

#### 2.2.4 Joint, Patch, Seal, and Repair Coating

Sealing and dielectric compound shall be a black, rubber based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 13 mm thick. Coating compound shall be cold-applied coal-tar base mastic or hot-applied coal-tar enamel. Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

#### 2.2.5 Backfill Shields

Shields shall consist of approved pipeline wrapping or fiberglass-reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose and installed in accordance with the manufacturer's recommendations. When joint bonds are required, due to the use of mechanical joints, the entire joint shall be protected by the use of a kraft paper joint cover. The joint cover shall be filled with poured-in, hot coat-tar enamel.

#### 2.2.6 Epoxy Potting Compound

Compound for encapsulating electrical wire splices to be buried underground shall be a two package system made for the purpose.

#### 2.2.7 Test Stations

Stations shall be of the flush-curb-box type and shall be the standard product of a recognized manufacturer. Test stations shall be complete with an insulated terminal block having the required number of terminals. The test station shall be provided with a lockable cover and shall have an embossed legend, "C.P. Test." A minimum of one test station shall be provided each component of the pipe. A minimum of six terminals shall be provided in each test station. A minimum of two leads are required to the metallic pipe from each test station. Other conductors shall be provided for each anode, other foreign pipe, and reference cells as required. Test stations may be constructed of nonmetallic materials. However, if nonmetallic materials are utilized, as a minimum, the materials shall be resistant to damage from ultraviolet radiation, contain good color retention qualities, contain high strength qualities, and be resistant to accidental or vandalistic impacts that might be normally encountered in the environment for which they are to be installed. The test stations shall be listed for the particular application for which they are to be utilized.

#### 2.2.8 Joint and Continuity Bonds

Bonds shall be provided across all joints in metallic water and gas lines, across any electrically discontinuous connections and all other pipes and structures with other than welded or threaded joints that are included in this cathodic protection system. Unless otherwise specified in the specifications, bonds between structures and across joints in pipe with other than welded or threaded joints shall be No. 8 AWG stranded copper

cable with polyethylene insulation. Bonds between structures shall contain sufficient slack for any anticipated movement between structures. Bonds across pipe joints shall contain a minimum of 102 mm of slack to allow for pipe movement and soil stress. Bonds shall be attached by exothermic welding. Exothermic weld areas shall be insulated with coating compound and approved, and witnessed by the Contracting Officer. Continuity bonds shall be installed as necessary to reduce stray current interference. Additional joint bondings shall be accomplished by the Contractor where the necessity is discovered during construction or testing or where the Contracting Officer's representative directs that such bonding be done. Joint bonding shall include all associated excavation and backfilling. There shall be a minimum of two continuity bonds between each structure and other than welded or threaded joints. The Contractor shall test for electrical continuity across all joints with other than welded or threaded joints and across all metallic portions or components. The Contractor shall provide bonding as required and as specified above until electrical continuity is achieved. Bonding test data shall be submitted for approval.

#### 2.2.9 Resistance Bonds

Resistance bonds should be adjusted as outlined in this specification. Alternate methods may be used if they are approved by the Contracting Officer.

#### 2.2.10 Stray Current Measurements

Stray current measurements should be performed at each test station. Stray currents resulting from lightning or overhead alternating current (AC) power transmission systems shall be mitigated in accordance with NACE RP0177.

#### 2.2.11 Electrical Isolation of Structures

As a minimum, isolating flanges or unions shall be provided at the following locations:

- a. Connection of new metallic piping or components to existing piping.
- b. Pressure piping under floor slab to a building.

Isolation shall be provided at metallic connection of all lines to existing system and where connecting to a building. Additionally, isolation shall be provided between water, gas and/or forced main line; and foreign pipes that cross the new lines within 3.05 m. Isolation fittings, including isolating flanges and couplings, shall be installed aboveground or in a concrete pit.

##### 2.2.11.1 Electrically Isolating Pipe Joints

Electrically isolating pipe joints shall be of a type that is in regular factory production.

##### 2.2.11.2 Electrically Conductive Couplings

Electrically conductive couplings shall be of a type that has a published maximum electrical resistance rating given in the manufacturer's literature. Cradles and seals shall be of a type that is in regular factory production made for the purpose of electrically insulating the carrier pipe from the casing and preventing the incursion of water into the

annular space.

#### 2.2.11.3 Insulating Joint Testing

A Model 601 Insulation Checker, as manufactured by "Gas Electronics", or an approved equal, shall be used for insulating joint (flange) electrical testing.

#### 2.2.12 Underground Structure Coating

This coating specification shall take precedence over any other project specification and drawing notes, whether stated or implied, and shall also apply to the pipeline or tank supplier. No variance in coating quality shall be allowed by the Contractor or Base Construction Representative without the written consent of the designer. All underground metallic pipelines and tanks to be cathodically protected shall be afforded a good quality factory-applied coating. This includes all carbon steel, cast-iron and ductile-iron pipelines or vessels. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified. If non-metallic pipelines are installed, all metallic fittings on pipe sections shall be coated in accordance with this specification section.

a. The minimum nominal thickness of the metallic pipe joint or other component coating shall be 0.2 mm, plus or minus 5 percent.

b. Pipe and joint coating for factory applied or field repair material shall be applied as recommended by the manufacturer and shall be one of the following:

- (1) Continuously extruded polyethylene and adhesive coating system.
- (2) Polyvinyl chloride pressure-sensitive adhesive tape.
- (3) High density polyethylene/bituminous rubber compound tape.
- (4) Butyl rubber tape.
- (5) Coal tar epoxy.

##### 2.2.12.1 Field Joints

All field joints shall be coated with materials compatible with the pipeline coating compound. The joint coating material shall be applied to an equal thickness as the pipeline coating. Unbonded coatings shall not be used on these buried metallic components. This includes the elimination of all unbonded polymer wraps or tubes. Once the pipeline or vessel is set in the trench, an inspection of the coating shall be conducted. This inspection shall include electrical holiday detection. Any damaged areas of the coating shall be properly repaired. The Contracting Officer shall be asked to witness inspection of the coating and testing using a holiday detector.

##### 2.2.12.2 Inspection of Pipe Coatings

Any damage to the protective covering during transit and handling shall be repaired before installation. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. Occasional checks of holiday detector



potential will be made by the Contracting Officer's representative to determine suitability of the detector. All labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor.

a. Protective covering for aboveground piping system: Finish painting shall conform to the applicable paragraph of SECTION: 09900 PAINTING, GENERAL, and as follows:

b. Ferrous surfaces: Shop-primed surfaces shall be touched-up with ferrous metal primer. Surfaces that have not been shop-primed shall be solvent-cleaned. Surfaces that contain loose rust, loose mil scale, and other foreign substances shall be mechanically-cleaned by power wire-brushing and primed with ferrous metal primer. Primed surface shall be finished with two (2) coats of exterior oil paint and vinyl paint. Coating for each entire piping service shall be an approved pipe line wrapping having a minimum coating resistance of 50,000 Ohms per 0.0929 square meters.

#### 2.2.13 Resistance Wire

Wire shall be No. 16 or No. 22 nickel-chromium wire with TW insulation.

#### 2.2.14 Electrical Connections

Electrical connections shall be done as follows:

a. Exothermic welds shall be "Cadweld", "Bundy", "Thermoweld" or an approved equal. Use of this material shall be in strict accordance with the manufacturer's recommendations.

b. Electrical-shielded arc welds shall be approved for use on steel pipe by shop drawing submittal action.

c. Brazing shall be as specified in Paragraph: Lead Wire Connections.

#### 2.2.15 Electrical Tape

Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

#### 2.2.16 Permanent Reference Electrodes

Permanent reference electrodes shall be Cu-CuSO4 electrodes suitable for direct burial. Electrodes shall be guaranteed by the supplier for 15 years' service in the environment in which they shall be placed. Electrodes shall be installed directly beneath pipe, or metallic component.

#### 2.2.17 Casing

Where a pipeline is installed in a casing under a roadway or railway, the pipeline shall be electrically insulated from the casing, and the annular space sealed and filled with an approved corrosion inhibiting product against incursion of water.

### PART 3 EXECUTION

#### 3.1 CRITERIA OF PROTECTION

Acceptance criteria for determining the adequacy of protection on a buried underground pipe or metallic component shall be in accordance with NACE RP0169 and as specified below.

### 3.1.1 Iron and Steel

The following method (a) shall be used for testing cathodic protection voltages. If more than one method is required, method (b) shall be used.

a. A negative voltage of at least minus 850 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode connecting the earth (electrolyte) directly over the underground component. Determination of this voltage shall be made with the cathodic protection system in operation. Voltage drops shall be considered for valid interpretation of this voltage measurement. A minimum of minus 850 millivolts "instant off" potential between the underground component being tested and the reference cell shall be achieved over 95 percent of the area of the structure. Adequate number of measurements shall be obtained over the entire structure, pipe, tank, or other metallic component to verify and record achievement of minus 850 millivolts "instant off." This potential shall be obtained over 95 percent of the total metallic area without the "instant off" potential exceeding 1200 millivolts.

b. A minimum polarization voltage shift of 100 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode contacting the earth directly over the underground component. This polarization voltage shift shall be determined by interrupting the protective current and measuring the polarization decay. When the protective current is interrupted, an immediate voltage shift will occur. The voltage reading, after the immediate shift, shall be used as the base reading from which to measure polarization decay. Measurements achieving 100 millivolts decay shall be made over 95 percent of the metallic surface being protected.

c. For any metallic component, a minimum of four measurements shall be made using subparagraph (a), above, and achieving the "instant off" potential of minus 850 millivolts. Two measurements shall be made over the anodes and two measurements shall be made at different locations near the component and farthest away from the anode.

### 3.1.2 Aluminum

Aluminum underground component shall not be protected to a potential more negative than minus 1200 millivolts, measured between the underground component and a saturated copper-copper sulphate reference electrode contacting the earth, directly over the metallic component. Resistance, if required, shall be inserted in the anode circuit within the test station to reduce the potential of the aluminum to a value which will not exceed a potential more negative than minus 1200 millivolts. Voltage shift criterion shall be a minimum negative polarization shift of 100 millivolts measured between the metallic component and a saturated copper-copper sulphate reference electrode contacting the earth, directly over the metallic component. The polarization voltage shift shall be determined as outlined for iron and steel.

### 3.1.3 Copper Piping

For copper piping, the following criteria shall apply: A minimum of 100 millivolts of cathodic polarization between the structure surface and a

stable reference electrode contacting the electrolyte. The polarization voltage shift shall be determined as outlined for iron and steel.

### 3.2 ANODE STORAGE AND INSTALLATION

#### 3.2.1 Anode Storage

Storage area for magnesium anodes will be designated by the Contracting Officer. If anodes are not stored in a building, tarps or similar protection should be used to protect anodes from inclement weather. Packaged anodes, damaged as a result of improper handling or being exposed to rain, shall be resacked by the Contractor and the required backfill added.

#### 3.2.2 Anode Installation

Unless otherwise authorized, installation shall not proceed without the presence of the Contracting Officer. Anodes of the size specified shall be installed to the depth and at the locations proposed in the approved design. Locations may be changed to clear obstructions with the approval of the Contracting Officer. Anodes shall be installed in sufficient number and of the required type, size, and spacing to obtain a uniform current distribution over the surface of the structure. The anode system shall be designed for a life of 25 years of continuous operation. Anodes shall be installed as designed in a dry condition after any plastic or waterproof protective covering has been completely removed from the water permeable, permanent container housing the anode metal. The anode connecting wire shall not be used for lowering the anode into the hole. The annular space around the anode shall be backfilled with fine earth in 150 mm layers and each layer shall be hand tamped. Care must be exercised not to strike the anode or connecting wire with the tamper. Approximately 20 liters of water shall be applied to each filled hole after anode backfilling and tamping has been completed to a point about 150 mm above the anode. After the water has been absorbed by the earth, backfilling shall be completed to the ground surface level.

##### 3.2.2.1 Single Anodes

Single anodes shall be connected to the pipeline allowing adequate slack in the connecting wire to compensate for movement during backfill operation.

##### 3.2.2.2 Groups of Anodes

Groups of anodes shall be connected to an anode header cable. The anode header cable shall make contact with the structure to be protected only through a test station. Anode lead connection to the anode header cable shall be made by an approved crimp connector or exothermic weld and splice mold kit with appropriate potting compound.

##### 3.2.2.3 Welding Methods

Connections to ferrous pipe shall be made by exothermic weld methods manufactured for the type of pipe supplied. Electric arc welded connections and other types of welded connections to ferrous pipe and structures shall be approved before use.

#### 3.2.3 Anode Placement - General

Packaged anodes shall be installed completely dry, and shall be lowered

into holes by rope sling or by grasping the cloth gather. The anode lead wire shall not be used in lowering the anodes. The hole shall be backfilled with fine soil in 150 mm layers and each layer shall be hand-tamped around the anode. Care must be exercised not to strike the anode or lead wire with the tamper. If immediate testing is to be performed, water shall be added only after backfilling and tamping has been completed to a point 150 mm above the anode. Approximately 8 liters of water may be poured into the hole. After the water has been absorbed by the soil, backfilling and tamping may be completed to the top of the hole. Anodes shall be installed as specified. In the event a rock strata is encountered prior to achieving specified augered-hole depth, anodes may be installed horizontally to a depth at least as deep as the bottom of the pipe, with the approval of the Contracting Officer.

#### 3.2.4 Underground Pipeline

Anodes shall be installed at a minimum of 2.5 meters and a maximum of 3 meters from the line to be protected.

#### 3.2.5 Installation Details

Details shall conform to the requirements of this specification.

#### 3.2.6 Lead Wire Connections

##### 3.2.6.1 Underground Pipeline (Metallic)

To facilitate periodic electrical measurements during the life of the sacrificial anode system and to reduce the output current of the anodes, if required, all anode lead wires shall be connected to a test station and buried a minimum of 610 mm in depth. The cable shall be No. 10 AWG, stranded copper, polyethylene or RHW-USE insulated cable. The cable shall make contact with the structure only through a test station. Resistance wire shall be installed between the cable and the pipe cable, in the test station, to reduce the current output, if required. Anode connections, except in the test station, shall be made with exothermic welding process, and shall be insulated by means of at least three layers of electrical tape; and all lead wire connections shall be installed in a moistureproof splice mold kit and filled with epoxy resin. Lead wire-to-structure connections shall be accomplished by an exothermic welding process. All welds shall be in accordance with the manufacturer's recommendations. A backfill shield filled with a pipeline mastic sealant or material compatible with the coating shall be placed over the weld connection and shall be of such diameter as to cover the exposed metal adequately.

##### 3.2.6.2 Resistance Wire Splices

Resistance wire connections shall be accomplished with silver solder and the solder joints wrapped with a minimum of three layers of pressure-sensitive tape. Lead wire connections shall be installed in a moistureproof splice mold kit and filled with epoxy resin.

#### 3.2.7 Location of Test Stations

Test stations shall be of the type and location shown and shall be curb box mounted. Buried insulating joints shall be provided with test wire connections brought to a test station. Unless otherwise shown, other test stations shall be located as follows:

- a. At 300 m intervals or less.
- b. Where the pipe or conduit crosses any other metal pipe.
- c. At both ends of casings under roadways and railways.
- d. Where both sides of an insulating joint are not accessible above ground for testing purposes.

### 3.2.8 Underground Pipe Joint Bonds

Underground pipe having other than welded or threaded coupling joints shall be made electrically continuous by means of a bonding connection installed across the joint.

## 3.3 ELECTRICAL ISOLATION OF STRUCTURES

### 3.3.1 Isolation Joints and Fittings

Isolating fittings, including main line isolating flanges and couplings, shall be installed aboveground, or within manholes, wherever possible. Where isolating joints must be covered with soil, they shall be fitted with a paper joint cover specifically manufactured for covering the particular joint, and the space within the cover filled with hot coal-tar enamel. Isolating fittings in lines entering buildings shall be located at least 305 mm above grade of floor level, when possible. Isolating joints shall be provided with grounding cells to protect against over-voltage surges or approved surge protection devices. The cells shall provide a low resistance across isolating joint without excessive loss of cathodic current.

### 3.3.2 Gas Distribution Piping

Electrical isolation shall be provided at each building riser pipe to the pressure regulator and at all points where a short to another structure or to a foreign structure may occur.

## 3.4 TRENCHING AND BACKFILLING

Trenching and backfilling shall be in accordance with Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS.

## 3.5 TESTS AND MEASUREMENTS

### 3.5.1 Baseline Potentials

Each test and measurement will be witnessed by the Contracting Officer. The Contractor shall notify the Contracting Officer a minimum of 5 working days prior to each test. After backfill of the pipe, the static potential-to-soil of the pipe shall be measured. The locations of these measurements shall be identical to the locations specified for pipe-to-reference electrode potential measurements. The initial measurements shall be recorded.

### 3.5.2 Isolation Testing

Before the anode system is connected to the pipe, an isolation test shall be made at each isolating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two isolated

sections of the pipe. Any isolating fittings installed and found to be defective shall be reported to the Contracting Officer.

#### 3.5.2.1 Insulation Checker

A Model 601 insulation checker, as manufactured by "Gas Electronics", or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. Testing shall conform to the manufacturer's operating instructions. Test shall be witnessed by the Contracting Officer. An isolating joint that is good will read full scale on the meter. If an isolating joint is shorted, the meter pointer will be deflected or near zero on the meter scale. Location of the fault shall be determined from the instructions, and the joint shall be repaired. If an isolating joint is located inside a vault, the pipe shall be sleeved with insulator when entering and leaving the vault.

#### 3.5.2.2 Cathodic Protection Meter

A Model B3A2 cathodic protection meter, as manufactured by "M.C. Miller" or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. This test shall be performed in addition to the Model 601 insulation checker. Continuity is checked across the isolation joint after the test lead wire is shorted together and the meter adjusted to scale. A full-scale deflection indicates the system is shorted at some location. The Model 601 verifies that the particular insulation under test is good and the Model B3A2 verifies that the system is isolated. If the system is shorted, further testing shall be performed to isolate the location of the short.

#### 3.5.3 Anode Output

As the anodes or groups of anodes are connected to the pipe, current output shall be measured with an approved clamp-on milliammeter, calibrated shunt with a suitable millivoltmeter or multimeter, or a low resistance ammeter. (Of the three methods, the low-resistance ammeter is the least desirable and most inaccurate. The clamp-on milliammeter is the most accurate.) The valves obtained and the date, time, and location shall be recorded.

#### 3.5.4 Reference Electrode Potential Measurements

Upon completion of the installation and with the entire cathodic protection system in operation, electrode potential measurements shall be made using a copper-copper sulphate reference electrode and a potentiometer-voltmeter, or a direct-current voltmeter having an internal resistance (sensitivity) of not less than 10 megohms per volt and a full scale of 10 volts. The locations of these measurements shall be identical to the locations used for baseline potentials. The values obtained and the date, time, and locations of measurements shall be recorded. No less than eight measurements shall be made over any length of line or component. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line.

#### 3.5.5 Location of Measurements

##### 3.5.5.1 Piping or Conduit

For coated piping or conduit, measurements shall be taken from the reference electrode located in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test

leads, or by other means suitable for test purposes. Pipe-to-soil potential measurements shall be made at intervals not exceeding 3 meters. The Contractor may use a continuous pipe-to-soil potential profile in lieu of 1.5 meter interval pipe-to-soil potential measurements. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line adjacent to the riser. Potentials shall be plotted versus distance to an approved scale. Locations where potentials do not meet or exceed the criteria shall be identified and reported to the Contracting Officer's representative.

#### 3.5.5.2 Omitted

#### 3.5.5.3 Casing Tests

Before final acceptance of the installation, the electrical separation of carrier pipe from casings shall be tested and any short circuits corrected.

#### 3.5.5.4 Interference Testing

Before final acceptance of the installation, interference tests shall be made with respect to any foreign pipes in cooperation with the owner of the foreign pipes. A full report of the tests giving all details shall be made. Stray current measurements shall be performed at all isolating locations and at locations where the new pipeline crosses foreign metallic pipes. The method of measurements and locations of measurements shall be submitted for approval. As a minimum, stray current measurements shall be performed at the following locations:

- a. Connection point of new pipeline to existing pipeline.
- b. Crossing points of new pipeline with existing lines.

Results of stray current measurements shall also be submitted for approval.

#### 3.5.5.5 Holiday Test

Any damage to the protective covering during transit and handling shall be repaired before installation. After field-coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. Holidays in the protective covering shall be repaired upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer to determine suitability of the detector. Labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor. The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

#### 3.5.5.6 Recording Measurements

All pipe-to-soil potential measurements, including initial potentials where required, shall be recorded. The Contractor shall locate, correct and report to the Contracting Officer any short circuits to foreign pipes encountered during checkout of the installed cathodic protection system. Pipe-to-soil potential measurements shall be taken on as many pipes as necessary to determine the extent of protection or to locate short-circuits.

### 3.6 TRAINING COURSE

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions. At least 14 days prior to date of proposed conduction of the training course, the training course curriculum shall be submitted for approval, along with the proposed training date. Training shall consist of demonstration of test equipment, providing forms for test data and the tolerances which indicate that the system works.

### 3.7 CLEANUP

The Contractor shall be responsible for cleanup of the construction site. All paper bags, wire clippings, etc., shall be disposed of as directed. Paper bags, wire clippings and other waste shall not be put in bell holes or anodes excavation.

### 3.8 MISCELLANEOUS INSTALLATION AND TESTING

#### 3.8.1 Coatings

All aboveground pipeline shall be coated as approved. The coating shall have a minimum thickness of 0.18 mm. The pipeline coating shall be in accordance with all applicable Federal, State, and local regulations.

#### 3.8.2 Excavation

In the event rock is encountered in providing the required depth for anodes, the Contractor shall determine an alternate approved location and, if the depth is still not provided, an alternate plan shall be submitted to the Contracting Officer. Alternate techniques and depths must be approved prior to implementation.

### 3.9 SPARE PARTS

After approval of shop drawings, and not later than 3 months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. In addition, the Contractor shall supply information for material and equipment replacement for all other components of the complete system, including anodes, cables, splice kits and connectors, corrosion test stations, and any other components not listed above.

### 3.10 SEEDING

Seeding shall be done by the Contractor, as directed, in all unsurfaced locations disturbed by this construction. In areas where grass cover exists, it is possible that sod can be carefully removed, watered, and stored during construction operations, and replaced after the operations are completed since it is estimated that no section of pipeline should remain uncovered for more than 2 days. The use of sod in lieu of seeding shall require approval by the Contracting Officer.



### 3.11 SYSTEM TESTING

The Contractor shall submit a report including potential measurements taken at adequately-close intervals to establish that minus 850 millivolts potential, "instant-off" potential, is provided, and that the cathodic protection is not providing interference to other foreign pipes causing damage to paint or pipes. The report shall provide a narrative describing how the criteria of protection is achieved without damaging other pipe or structures in the area.

### 3.12 CLEARING OF TREES AND UNDERBRUSH

In the areas of the anode beds, all trees and underbrush shall be cleared and grubbed. Anode beds shall not be installed in areas that conflict with existing trees scheduled to remain in place.

-- End of Section --

## Appendix

Barracks Complex, LI 43542, FY-2000  
Hunter Army Airfield, Georgia

Resistivity Survey, 9 Nov 99

### 1200 Block

Apparent Resistivity line tested along north side of the proposed Battalion Headquarters building.

Ohms	ohm-cm	ft
17.48	8.37E+03	2.5
32.80	3.14E+04	5.0
14.45	2.77E+04	10.0
10.73	3.08E+04	15.0
5.22	2.00E+04	20.0
4.64	2.67E+04	30.0
3.20	2.45E+04	40.0

### 300 Block

Apparent Resistivity line tested along south side of the proposed Battalion Headquarters building.

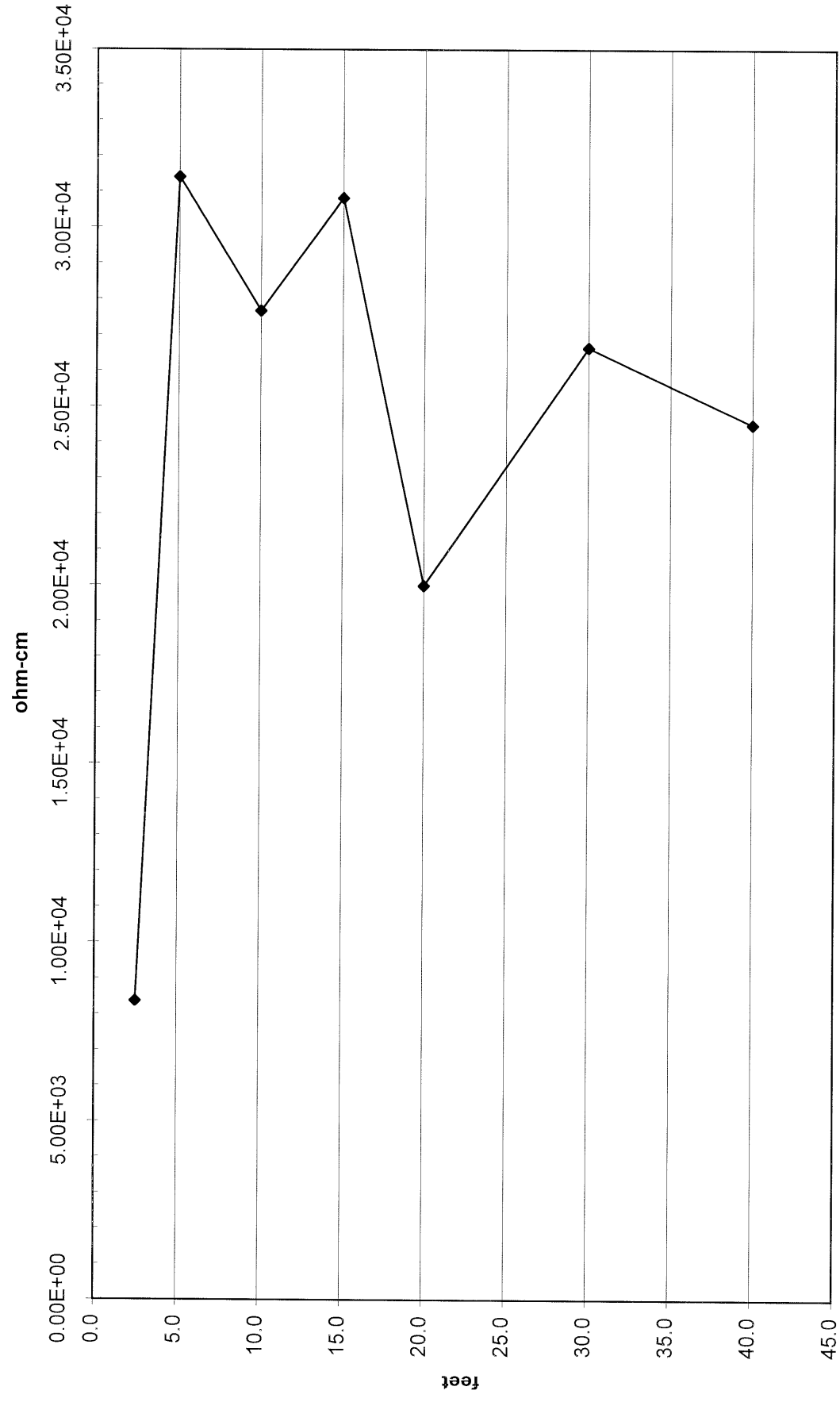
Ohms	ohm-cm	ft
209.00	1.00E+05	2.5
111.70	1.07E+05	5.0
47.30	9.06E+04	10.0
21.20	6.09E+04	15.0
17.08	6.54E+04	20.0
11.74	6.75E+04	30.0

### 100 Block

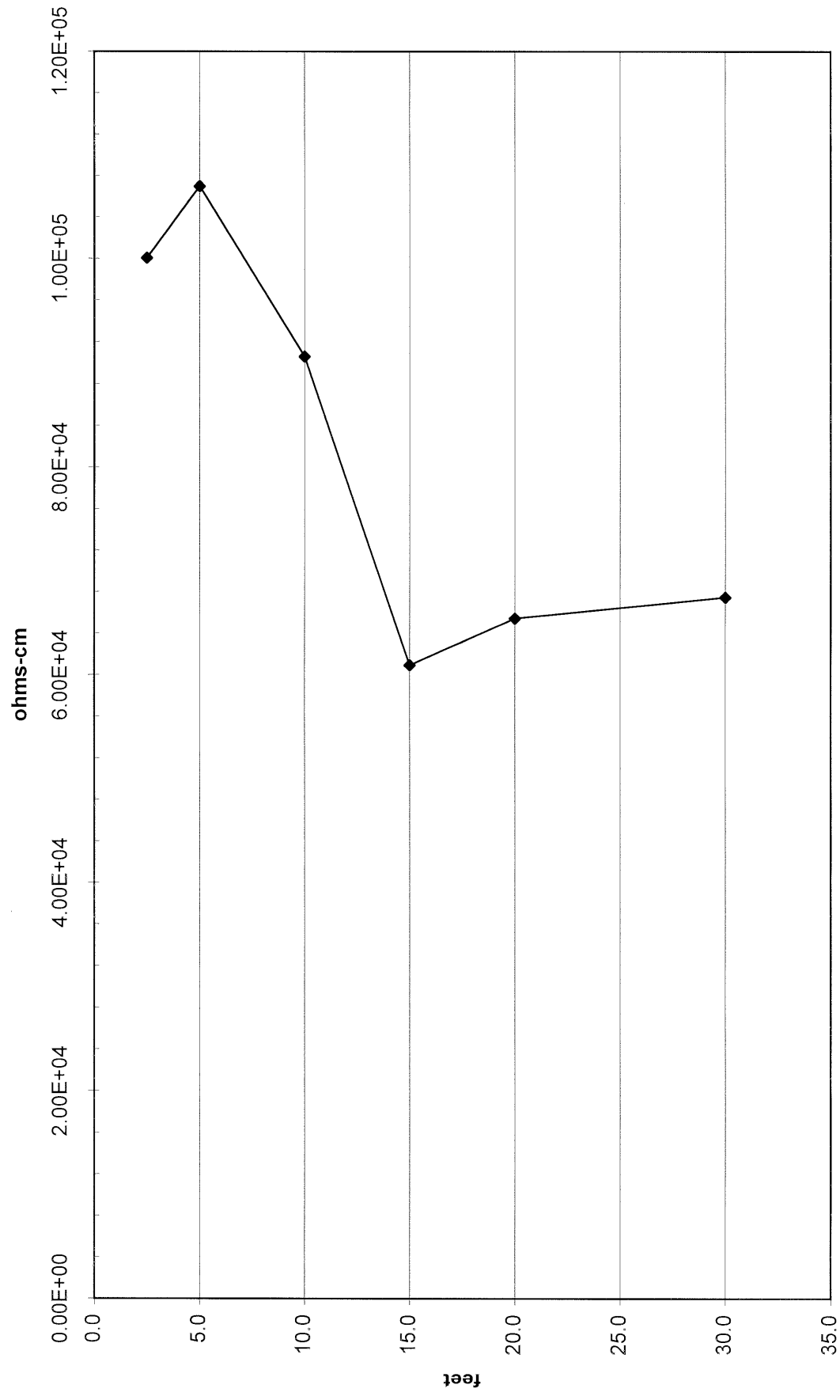
Apparent Resistivity line tested along north side of the proposed Dining Facility building.

Ohms	ohm-cm	ft
258.00	1.24E+05	2.5
75.50	7.23E+04	5.0
19.83	3.80E+04	10.0
10.53	3.02E+04	15.0
7.79	2.98E+04	20.0
4.74	2.72E+04	30.0

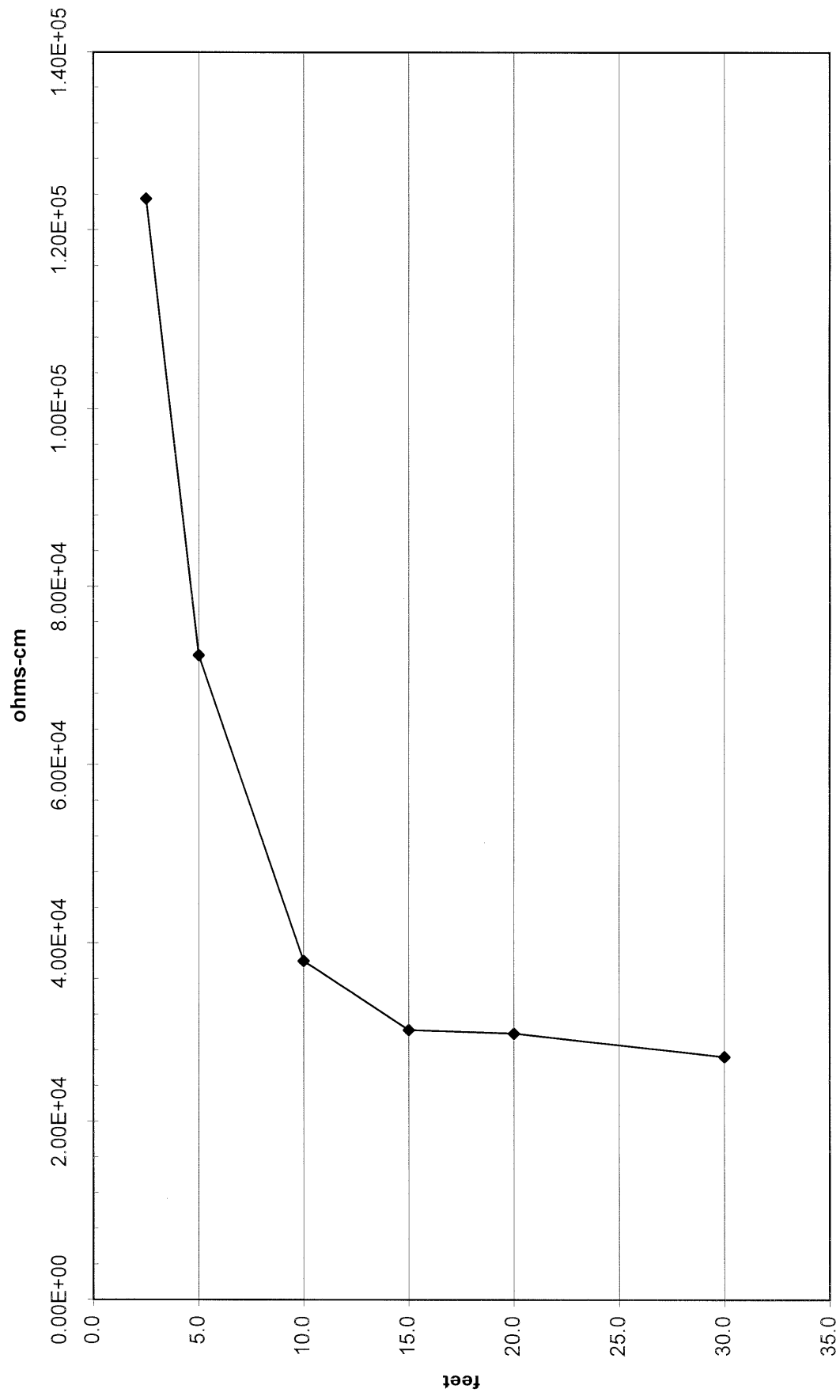
Apparent Resistivity, Bn HQs 1200 Block



Apparent Resistivity, Bn HQs 300 Block



Apparent Resistivity, Dining Facility 100 Block



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05/97

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CEGS 13202 (May 1997)

Includes changes through Notice 4 (July 1999)

## SECTION 13202

FUEL STORAGE SYSTEMS  
05/97

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN PETROLEUM INSTITUTE (API)

API Publ 1581	(1989; R 1994; Addenda July 1995) Specifications and Qualification Procedures for Aviation Jet Fuel Filter/Separators
API RP 1631	(1997) Interior Lining of Underground Storage Tanks
API Spec 5L	(1995; Errata Dec 1997) Line Pipe
API Spec 6D	(1994; Supple 1 June 1996; Supple 2 Dec 1997) Pipeline Valves (Gate, Plug, Ball, and Check Valves)
API Spec 6FA	(1994) Fire Test for Valves
API Std 594	(1997) Check Valves: Wafer, Wafer-Lug and Double Flanged Type
API Std 607	(1993) Fire Test for Soft-Seated Quarter-Turn Valves

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997a) Carbon Structural Steel
ASTM A 53	(1998) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 167	(1996) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 181/A 181M	(1995b) Carbon Steel Forgings, for General-Purpose Piping
ASTM A 182/A 182M	(1997c) Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and

## Parts for High-Temperature Service

ASTM A 193/A 193M	(1998) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194/A 194M	(1998) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 216/A 216M	(1998) Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A 234/A 234M	(1997) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 307	(1997) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 733	(1993) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B 687	(1996) Brass, Copper, and Chromium-Plated Pipe Nipples
ASTM D 229	(1996) Rigid Sheet and Plate Materials Used for Electrical Insulation
ASTM F 436M	(1993) Hardened Steel Washers (Metric)
ASTM F 1199	(1988; R 1998) Cast (All Temperature and Pressures) and Welded Pipe Line Strainers (150 psig and 150 degrees F Maximum)
ASTM F 1200	(1988; R 1998) Fabricated (Welded) Pipe Line Strainers (Above 150 psig and 150 degrees F)
ASTM G 62	(1987; R 1998) Standard Test Methods for Holiday Detection in Pipeline Coatings

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	(1996) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.34	(1996; B16.34a) Valves - Flanged, Threaded, and Welding End
ASME B16.39	(1986; R 1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
ASME B31.3	(1996; B31.3a; B31.3b; B31.3c) Process Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPV IX	(1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C203	(1997) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
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## AMERICAN WELDING SOCIETY (AWS)

AWS A5.1	(1991) Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.4	(1992) Stainless Steel Electrodes for Shielded Metal Arc Welding

## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1996) Pipe Hangers and Supports - Selection and Application

## NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE RP0169	(1996) Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0185	(1996) Extruded, Polyolefin Resin Coating Systems with Soft Adhesives for Underground or Submerged Pipe
NACE RP0190	(1995) External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerger PipeLines and Piping Systems
NACE RP0274	(1998) High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30 (1996; Errata TIA 96-2) Flammable and Combustible Liquids Code

NFPA 30A (1996) Automobile and Marine Service Station Code

NFPA 70 (1999) National Electrical Code

THE SOCIETY FOR PROTECTIVE COATING (SSPC)

SSPC SP 6/NACE 3 (1994) Commercial Blast Cleaning

STEEL TANK INSTITUTE (STI)

STI P3 (1997) Specification and Manual for External Corrosion Protection of Underground Steel Storage Tanks

UNDERWRITERS LABORATORIES (UL)

UL 142 (1993; Rev Jul 1998) Steel Aboveground Tanks for Flammable and Combustible Liquids

UL 567 (1996; Rev thru Oct 1997) Pipe Connectors for Petroleum Products and LP-Gas

## 1.2 SYSTEM DESCRIPTION

The work shall include the design, fabrication and installation of the entire fuel storage and dispensing type system in conformance with pertinent federal, state, and local code requirements. The completed installation shall conform to NFPA 30 and NFPA 30A as applicable.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Fueling System; GA|F.

Manufacturer's standard catalog data, prior to the purchase or installation of the particular component, highlighted to show brand name, model number, size, options, performance charts and curves, etc., in sufficient detail to demonstrate compliance with contract requirements on all parts and equipment.

Permitting; FIO.

Six copies of all required federal, state, and local permits.

Registration; FIO.

Required tank registration forms, 30 days after contract award, in order for the Contracting Officer to submit the forms to the regulatory agency.

Spare Parts Data; FIO.

Spare parts data for each different item of equipment specified, after approval of detail drawings and not later than 3 months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, a recommended spare parts list for 1 year of operation, and a list of the parts recommended by the manufacturer to be replaced on a routine basis.

#### SD-04 Drawings

Fueling System; GA|F.

Detail drawings including a complete list of equipment and materials. Detail drawings shall contain:

- (1) Complete piping and wiring drawings and schematic diagrams of the overall system.
- (2) Equipment layout and anchorage.
- (3) Clearances required for maintenance and operation.
- (4) Any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Monitoring Systems; GA|F.

Detail drawings of the monitoring system including a complete list of equipment and materials. Drawings shall contain:

- (1) An overview drawing which details the leak detection system operation.
- (2) An overview drawing which details the liquid level and setpoint monitoring.
- (3) Wiring schematics for each part of the fueling system. The schematics shall indicate each operating device along with their normal ranges of operating values (including pressures, temperatures, voltages, currents, speeds, etc.).
- (4) Single line diagrams of the system.
- (5) Panel layout along with panel mounting and support details.

#### SD-06 Instructions

Installation; FIO.

Manufacturer's installation instructions and procedures on all parts and equipment.

Framed Instructions; FIO.

Framed instructions for posting, at least 2 weeks prior to construction completion.

Monitoring Systems; FIO.

System diagrams for posting, at least 2 weeks prior to construction completion, including distance markings so that alarm indications can be correlated to leak location in plan view if a cable detection system is used. The diagrams shall include a piping and wiring display map with schematic diagrams from the leak detection system manufacturer. The diagrams shall be framed under glass or laminated plastic and be posted where indicated by the Contracting Officer.

#### SD-07 Schedules

Filter-Separator Factory Tests; FIO.

A schedule, at least 2 weeks prior to the factory tests, which identifies the date, time, and location for the tests.

Tests; FIO.

A letter, at least 10 working days in advance of each test, advising the Contracting Officer of the test. Individual letters shall be provided for each test specified herein.

Demonstrations; GA|F.

A letter, at least 14 working days prior to the proposed training date, scheduling a proposed date for conducting the onsite training.

#### SD-08 Statements

Experience; FIO.

A letter listing prior projects, the date of construction, a point of contact for each prior project, the scope of work of each prior project, and a detailed list of work performed. The letter shall also provide evidence of prior manufacturer's training, state licensing, and other related information.

Welding; FIO.

A letter listing the qualifying procedures for each welder. The letter shall include supporting data such as test procedures used, what was tested to, etc., and a list of the names of all qualified welders and their identification symbols.

Radiographic Tests for Aviation Fuel Piping; GA|F.

A letter, prior to performing any radiographic pipe tests, identifying the commercial or testing laboratory responsible for performing the test. The letter shall define the laboratory's qualifications and previously related job experience.

Verification of Dimensions; FIO.

A letter stating the date the site was visited and a listing of all discrepancies found.

Fuel Supply; FIO.

A letter, at least 120 days prior to fuel delivery, stating the amount of

fuel required for testing, flushing, cleaning, or startup of the system. The letter shall define the required dates of each fuel delivery necessary.

Exterior Coating for Belowground Steel Piping; FIO.

Certification, prior to performing the exterior coating tests, from the tester manufacturer of the electric holiday detector's latest calibration date and crest voltage testing.

#### SD-09 Reports

Filter-Separator Factory Tests; GA|F.

Six copies of the report in bound letter-size booklets. Report shall certify compliance with the testing and qualification procedures defined in API Publ 1581. The report shall contain complete records of the tests including data sheets, performance curves, chronological test records, photographs, sample calculations, test procedures, and a description of the test apparatus. The report shall include color photographs of the sample elements before and after tests.

Tests; GA|F.

Six copies of each test containing the information described below in bound letter-size booklets. Individual reports shall be provided for the storage tank tests, the piping tests, the system performance tests, the high level alarm test, and the system leak tests. Drawings shall be folded blue lines, with the title block visible.

- (1) The date the tests were performed.
- (2) A list of equipment used, with calibration certifications.
- (3) A copy of measurements taken.
- (4) The parameters to be verified.
- (5) The condition specified for the parameter.
- (6) The inspection results, signed, dated, and certified by the installer. The certification shall state that required procedures were accomplished, that the procedures were conducted in compliance with the plans and specifications.
- (7) A description of adjustments performed.

#### SD-19 Operation and Maintenance Manuals

Operation Manuals; FIO.

Eight complete copies of operation manuals in bound letter-size booklets listing step-by-step procedures required for system startup, operation, and shutdown at least two weeks prior to the demonstrations. The manuals shall include the manufacturer's name, model number, service manual, a brief description of each piece of equipment, and the basic operating features of each piece of equipment. The manuals shall include procedures necessary for annual tightness testing of the storage tanks and secondary containment piping.

Maintenance Manuals; FIO.

Eight complete copies of maintenance manuals in bound letter-size booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide at least 2 weeks prior to the demonstrations. The manuals shall include piping, equipment layouts, and simplified wiring and control diagrams of the system as installed.

#### 1.4 QUALIFICATIONS

##### 1.4.1 Experience

Each installation Contractor shall have successfully completed at least 3 projects of the same scope and the same size or larger within the last 6 years. Each installation Contractor shall demonstrate specific installation experience in regard to the specific system installation to be performed. Each installation Contractor shall have taken, if applicable, manufacturer's training courses on the installation of piping, leak detection, and tank management systems and meet the licensing requirements in the state.

##### 1.4.2 Welding

Welding shall be in accordance with qualifying procedures using performance qualified welders and welding operators. Welding tests shall be performed at the work site. Procedures and welders shall be qualified in accordance with ASME BPV IX. Each welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL.

#### 1.5 REGULATORY REQUIREMENTS

##### 1.5.1 Permitting

Contractor shall obtain necessary permits in conjunction with the installation of belowground storage tanks as required by federal, state, or local authority.

##### 1.5.2 Registration

Contractor shall obtain and complete all required tank registration forms required by federal, state, and local authorities.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

Stored items shall be protected from the weather and contamination. Proper protection and care of material before, during, and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

#### 1.7 PROJECT/SITE CONDITIONS

##### 1.7.1 Verification of Dimensions

After becoming familiar with all details of the project, the Contractor shall verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.



### 1.7.2 Fuel Supply

Fuel required for the flushing, cleaning, and testing of materials, equipment, piping, meters, pumps, instruments, etc., as specified in this section shall be provided by the Contractor. The Contractor shall provide the labor, equipment, appliances, and materials required for the flushing, cleaning, and testing operations. Systems shall not be flushed, cleaned, or tested with any fuel or liquid not intended for final system operation. Fuel used in the system shall remain the property of the Government.

### 1.7.3 Safety Requirements

Exposed moving parts, parts that produce high operating temperatures and pressures, parts which may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices shall be installed so that proper operation of equipment is not impaired.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2 year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience shall be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturer's catalogs, or brochures. Products having less than a 2 year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. Products shall be supported by a service organization. System components shall be environmentally suitable for the indicated locations. The completed installation shall conform to the applicable requirements of NFPA 30 or NFPA 30A, as applicable.

### 2.2 NAMEPLATES

Parts and equipment specified herein shall have an attached nameplate to list the manufacturer's name, address, component type or style, model or serial number, catalog number, capacity or size, and the system which is controlled. Plates shall be durable and legible throughout equipment life and made of stainless steel. Plates shall be fixed in prominent locations with nonferrous screws or bolts.

### 2.3 ELECTRICAL WORK

Electrical equipment, motors, and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical bonding of materials shall be performed in accordance with NFPA 70.

### 2.4 MATERIALS IN CONTACT WITH FUEL

Galvanized materials (zinc coated) shall not be allowed in direct contact with any fuel.

## 2.5 ABOVEGROUND STORAGE TANK

### 2.5.1 Skid-Mounted Tank

Tank shall be constructed of single wall stainless steel in accordance with NFPA 30, NFPA 30A, and UL 142. Tank shall be designed and manufactured for horizontal installation. Tank shall be mounted on the tank manufacturer's standard support skid. Skid shall span the entire length of the tank and shall separate the tank from the reinforced concrete slab by a minimum of 200 mm. A molded neoprene isolation pad shall be provided under the skid.

### 2.5.2 Omitted

### 2.5.3 Omitted

### 2.5.4 Omitted

### 2.5.5 Tank Exterior Protective Coating

Tank exterior protective coating shall be the manufacturer's standard except as modified herein.

### 2.5.6 Tank Interior Protective Coating

Tank shall be provided with an interior protective coating in accordance with API RP 1631 from the tank bottom up to 1 m off the bottom.

### 2.5.7 Omitted

### 2.5.8 Tank Piping Penetrations

The number and size of tank piping penetrations shall be provided as indicated. Nylon dielectric bushings shall be provided on all pipe connections to a tank. Pipe connections to a tank shall be through welded-in-place double tapered NPT couplings. The termination of fill lines within a tank shall be provided with an antisplash deflector.

### 2.5.9 Tank Cleanout and Gauge Connection

Tank shall be provided with a combination cleanout and gauge connection. The connection shall consist of a 50 mm pipe extending downward through the top of the tank to within 75 mm of the tank bottom. The entire length of pipe inside the tank shall be provided with 13 mm wide by 300 mm long slots at alternate locations. The top of the pipe shall be provided with a bronze top-seal type adapter with a corresponding locking type cap. Tank shall have an interior striker/impact plate attached directly under the cleanout and gauge connection. The striker/impact plate shall be a minimum of 6 mm in thickness, be larger in diameter than the tank penetration, and fit the curvature of the tank bottom.

### 2.5.10 Tank Atmospheric Venting

Vent pipe shall be in accordance with NFPA 30, NFPA 30A, and UL 142. Vent pipe sizing shall be not less than 32 mm nominal inside diameter.

### 2.5.11 Tank Emergency Venting

Vent shall be the rupture disc type calibrated to burst at 13.8 kPa (2 psig) pressure, and operate at 80 percent of burst setting. Vent shall comply with NFPA 30. There is no vacuum relief requirement but the disc may be

subjected to 1.3 kPa (3 ounces) of vacuum. Discs shall be provided with a flanged end connection. Disc holder shall have a nameplate showing design rating.

## 2.6 OMITTED

## 2.7 TANK GAUGES

### 2.7.1 Stick Gauge

Tank shall be provided with 2 stick gauges graduated in m and mm. Stick gauge shall be of wood and treated after graduating to prevent swelling or damage from the fuel being stored.

### 2.7.2 Tank Calibration Charts

Tank shall be furnished with 2 copies of calibrated charts which indicate the liquid contents in L for each 3 mm of tank depth.

### 2.7.3 Omitted

### 2.7.4 Hydrostatic Tank Gauge System

System shall be the dial type calibrated in liters. Gauge shall be manually actuated using a built-in hand pump. The transmission line from the gauge to the tank shall be seamless copper tubing run in Schedule 80 PVC carrier pipe. The tank assembly (fittings, air bells, and tubing) shall be installed according to the gauge manufacturer's recommendations.

## 2.8 ADAPTERS AND COUPLERS

### 2.8.1 Tight-Fit Fill Adapter

Adapter shall be bronze and be fitted with a Buna-N or Viton gasket. Adapter shall be the API standard 75 mm size. Adapter shall be a top seal adapter and provide a tight-fit connection to prevent vapor emissions during filling. The adapter shall be provided with a locking cap. The cap shall mate with the adapter and have a latching mechanism which provides a water tight seal. The cap shall provide some type of locking provision and be easily attachable and removable. The cap shall be attached to the tight-fit vapor recovery adapter by a 300 mm section of brass cable or fuel resistant rope.

### 2.8.2 Omitted

### 2.8.3 Omitted

### 2.8.4 Dry-Break Coupler

Coupler shall be an API standard and provide a tight-fit connection to prevent vapor emissions during fuel transfer. Coupler shall be compatible with the fuel product being handled and be a female connection. Seals within the coupler shall be Buna-N or Viton. Coupler shall have an internal manually operated shutoff valve. The valve shall have an external operating handle with the valve's position (open or close) clearly labeled. The internal valve shall not be capable of being manually opened unless the coupler is properly connected to a tank truck's tight-fit adapter.

## 2.9 OMITTED

## 2.10 OMITTED

## 2.11 SUPPLEMENTAL COMPONENTS

- 2.11.1 Omitted
- 2.11.2 Omitted
- 2.11.3 Omitted
- 2.11.4 Omitted

### 2.11.5 Cathodic Protection

Buried metallic components including pipe, anchors, conduit, etc., shall be provided with a cathodic protection system in accordance with Section 13110 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE). Cathodic protection for metal components that attach to a tank shall be coordinated and compatible with the tank corrosion control system.

### 2.11.6 Omitted

### 2.11.7 Electrically Isolating Flanges

Flanges shall be provided with an electrical insulating material of 1000 ohms minimum resistance conforming to ASTM D 229. The material shall be resistant to the effects of the type of fuel to be handled. Gaskets shall be full face and be provided between flanges. Flanges shall have full surface 0.75 mm thick, spiral-wound mylar insulating sleeves between the bolts and the holes in the flanges. Bolts may have reduced shanks of a diameter not less than the diameter at the root of the threads. High-strength 3 mm thick phenolic insulating washers shall be provided next to the flanges with flat circular stainless steel washers over the insulating washers. Bolts shall be long enough to compensate for the insulating gaskets and stainless steel washers.

### 2.11.8 Electrically Isolating Union

Union shall be provided with an electrical insulating material of 1000 ohms minimum resistance conforming to ASTM D 229. The material shall be resistant to the effects of the type of fuel to be handled.

### 2.11.9 Concrete Anchor Bolts

Concrete anchor bolts shall be group II, Type A, class 2 in accordance with ASTM A 307.

### 2.11.10 Bolts

Bolts shall be in accordance with ASTM A 193/A 193M, Grade B8.

### 2.11.11 Nuts

Nuts shall be in accordance with ASTM A 194/A 194M, Grade 8.

### 2.11.12 Washers

Washers shall be in accordance with ASTM F 436M, flat circular stainless steel. Washers shall be provided under each bolt head and nut.

### 2.11.13 Exterior Coating of Miscellaneous Items

Steel surfaces to be externally coated or painted shall be cleaned to a

commercial grade blast cleaning finish in accordance with SSPC SP 6/NACE 3 prior to the application of the coating. Exterior surfaces, other than stainless steel pipe and flexible connectors, which are not otherwise painted and do not require the application of an exterior coating, as well as all items supplied without factory-applied finish paint, not including primer only items, shall be painted as specified in Section 09900 PAINTING, GENERAL.

#### 2.11.14 Buried Utility Tape

Detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape shall be provided for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Tape shall be provided in minimum 75 mm width rolls, color coded for the utility involved, with warning identification imprinted in bold black letters continuously and repeatedly over entire tape length. Permanent code and letter coloring shall be used which is unaffected by moisture and other substances contained in trench backfill material.

2.12 OMITTED

2.13 OMITTED

#### 2.14 PIPING COMPONENTS

##### 2.14.1 Product Piping

Piping routinely carrying fuel shall be steel as defined herein.

##### 2.14.2 Omitted

##### 2.14.3 Vent and Vapor Recovery Piping

Piping shall be single wall steel as defined herein.

##### 2.14.4 Steel Pipe

Carbon steel pipe shall be in accordance with ASTM A 53, Type E or S, Grade B, or API Spec 5L, seamless or electric-weld, Grade B. Pipe smaller than 65 mm shall be Schedule 80. ASTM A 53 pipe 65 mm and larger shall be Schedule 40. API Spec 5L pipe 65 mm and larger shall be Schedule 40S.

##### 2.14.4.1 Connections for Steel Pipe

Connections for pipe or fittings smaller than 65 mm shall be forged, socket weld type, 2000 W.O.G. conforming to ASTM A 182/A 182M and ASME B16.11. Connections for pipe or fittings 65 mm and larger shall be butt weld type conforming to ASTM A 234/A 234M, Grade WPB and ASME B16.9 of the same wall thickness as the adjoining pipe. Piping in inaccessible locations, such as product piping inside of containment piping, shall be welded.

##### 2.14.4.2 Welding Electrodes

Welding electrodes shall be E70XX low hydrogen type conforming to AWS A5.1 or AWS A5.4.

##### 2.14.4.3 Threaded Connections

Threaded connections shall only be used on piping 50 mm in nominal size or smaller and only where indicated. Connections shall be in accordance with

ASME B16.3, Class 150. Threaded connections shall be sealed tightly with a thread sealant or lubricant which is compatible with the fuel to be handled.

2.14.5 Omitted

2.14.6 Omitted

2.14.7 Omitted

#### 2.14.8 Valves

Portions of a valve coming in contact with fuel shall be compatible with the fuel to be handled. Valves shall have bodies, bonnets, and covers constructed of cast steel conforming to ASTM A 216/A 216M, Grade WCB. Each valve shall have stainless steel stem and trim. Valves shall be suitable for a working pressure of 1900 kPa (275 psig) at 38 degrees C with a weatherproof housing and be provided with flanged end connections unless indicated otherwise. Seats, body seals, and stem seals shall be Viton or Buna-N.

##### 2.14.8.1 Gate

Valve shall be in accordance with API Spec 6D and conform to the fire test requirements of API Spec 6FA. Valve shall be of the flexible wedge disc type, conduit disc type, or double disc type. Valve shall be of the rising stem type with closed yoke, or the non-rising stem type equipped with a device to give positive visual indication of the valve's position.

##### 2.14.8.2 Swing Type Check

Valve shall be swing type conforming to API Spec 6D regular type. Check valves shall be the tilting disc, non-slam type. Discs and seating rings shall be renewable without removing from the line. The disc shall be guided and controlled to contact the entire seating surface.

##### 2.14.8.3 Wafer Type Check

Valves shall conform to API Spec 6D and API Std 594. Wafer type check valves may be provided in lieu of swing check valves in piping sizes larger than 100 mm.

##### 2.14.8.4 Ball

Valves 50 mm and larger shall conform to API Spec 6D. Valves smaller than 50 mm shall have one piece bodies and have a minimum bore not less than 55 percent of the internal cross sectional area of a pipe of the same nominal diameter. The ball shall be stainless steel. Valve shall be fire tested and qualified in accordance with API Spec 6FA or API Std 607. Valve shall be non-lubricated and operate from fully open to fully closed with 90 degree rotation of the ball.

##### 2.14.8.5 Plug

Valve shall be in accordance with API Spec 6D. Valve shall be non-lubricated, resilient, double seated, trunnion mounted type with a tapered lift plug capable of 2-way shutoff. Valve shall operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valve shall have weatherproof operators with mechanical position indicators.

##### 2.14.8.6 Globe

Valve shall conform to ASME B16.34.

#### 2.14.8.7 Pressure\Vacuum Vent Relief

Valve pressure and vacuum capacities shall be in accordance with NFPA 30. Valve shall be factory set for 5.2 kPa (12 ounces per square inch) pressure. Pressure and vacuum relief shall be provided by a single valve. Valve shall be constructed of cast steel or aluminum with flanged or threaded end connections. Trim shall be stainless steel. Inner valve pallet assemblies shall have a knife-edged drip ring around the periphery of the pallet to preclude condensation collection at the seats. Pallet seat inserts shall be of a material compatible with the fuel specified to be stored.

#### 2.14.9 Accessories

##### 2.14.9.1 Omitted

##### 2.14.9.2 Flanges

Flanges installed on equipment, fittings, or pipe shall be Class 150 pound flanges which are rated in accordance with ASME B16.5. Flanges shall be the 1.6 mm (1/16 inch) raised face type, except for connections to FRP pipe. Connections to FRP pipe shall be made with flat face flanges. Stainless steel flanges shall conform to ASTM A 182/A 182M. Aluminum flanges shall conform to ASTM A 182/A 182M, alloy 6061-T6 or alloy 356-T6. Carbon steel flanges shall conform to ASTM A 181/A 181M, Grade 2.

##### 2.14.9.3 Flange Gaskets

Flange gaskets shall be 2 mm (1/16 inch) thick, NBR, and be in accordance with ASME B16.21. Full-face gaskets shall be provided for flat-face flanged pipe joints. Ring gaskets shall be provided for raised-face flanged pipe joints.

##### 2.14.9.4 Steel Coupling

Coupling shall be in accordance with API Spec 5L, seamless, extra heavy, wrought steel with recessed ends.

##### 2.14.9.5 Welded Nipple

Nipple shall be in accordance with ASTM A 733 or ASTM B 687 and of the same material as the product piping.

##### 2.14.9.6 Threaded Union

Threaded unions shall only be used on cast steel piping 50 mm in nominal size or smaller and only where indicated. Union shall be in accordance with ASME B16.39, Class 150.

##### 2.14.9.7 Joint Compound

Joint compounds for any type of piping system shall be resistant to water and suitable for use with fuel containing 40 percent aromatics.

##### 2.14.9.8 Flexible Connector

Connectors shall conform to requirements of UL 567 and be the flexible metal hose, corrugated type with braided wire sheath covering. Connectors shall have close-pitch annular corrugations and be rated for a working pressure of at least 1900 kPa (275 psig) at 38 degrees C. Connectors shall have a minimum 300 mm live length with flanged end connections. Metal for hose and braided wire sheath shall be stainless steel in accordance with ASTM A 167.

#### 2.14.9.9 Strainer

Strainer shall be in accordance with ASTM F 1199 or ASTM F 1200, except as modified herein. Strainer shall be the cleanable, basket or "Y" type, and be the same size as the pipeline. Strainer body shall be fabricated of cast steel or brass with the bottom drilled and tapped. The body shall have arrows clearly cast on the sides indicating the direction of flow. Strainer shall be equipped with a removable cover and sediment screen. Screen shall be 60 mesh wire screen with larger wire mesh reinforcement. Screen shall be 0.76 mm brass or stainless steel. The ratio of net effective strainer area to the area of the connecting pipe shall be not less than 3 to 1.

#### 2.14.9.10 Pipe Hangers and Supports

Hangers and supports shall be of the adjustable type and conform to MSS SP-58 and MSS SP-69, except as modified herein. The finish of rods, nuts, bolts, washers, hangers, and supports shall be hot-dipped galvanized. Nuts, bolts, washers, and screws shall be Type 316 stainless steel when located under any pier. Miscellaneous metal shall be in accordance with ASTM A 36/A 36M, standard mill finished structural steel shapes, hot-dipped galvanized.

- a. Pipe Protection Shields. Shields shall conform to MSS SP-58 and MSS SP-69, Type 40, except material shall be Type 316 stainless steel. Shields shall be provided at each slide type pipe hanger and support.
- b. Low Friction Supports. Supports shall have self-lubricating anti-friction bearing elements composed of 100 percent virgin tetrafluoroethylene polymer and reinforcing aggregates, prebonded to appropriate backing steel members. The coefficient of static friction between bearing elements shall be 0.06 from initial installation for both vertical and horizontal loads and deformation shall not exceed 0.05 mm (0.002 inch) under allowable static loads. Bonds between material and steel shall be heat cured, high temperature epoxy. Design pipe hangers and support elements for the loads applied. Anti-friction material shall be a minimum of 2.3 mm (0.09 inch) thick. Steel supports shall be hot-dipped galvanized. Units shall be factory designed and manufactured.

#### 2.14.9.11 Exterior Coatings for Belowground Steel Piping

Piping placed in direct contact with backfill or soil shall be provided with an exterior protective coating.

- a. Pipe: Pipe shall receive protective coating system of factory-applied adhesive undercoat and continually extruded polyethylene coating conforming to NACE RP0185, Type A. The protective coating shall have a minimum thickness of 0.76 mm (30



mils).

- b. Fittings and Other Surfaces: Fittings, couplings, regular surfaces, damaged areas of extruded polyethylene coating and existing piping affected by the Contractor's operations shall be protected by the application of polyethylene tape which conforms to NACE RP0169 and NACE RP0190, 0.76 mm (30 mils) nominal thickness. Surfaces to be tape wrapped shall be clean, dry, grease free, and primed with a compatible primer prior to application of tape. Primer shall be as recommended by the tape manufacturer and approved by the pipe coating manufacturer. Heat shrink sleeves may be provided in lieu of tape and shall overlap the pipe coating not less than 150 mm.
- c. Irregular Surfaces: Irregular surfaces shall be protected with a cold-applied liquid primer and heated coal-tar tape in accordance with AWWA C203.

#### 2.14.9.12 Exterior Coating for Aboveground Steel Piping

Aboveground steel piping shall be painted as specified in Section 09900 PAINTING, GENERAL. Paint shall be rated for use on hot metal surfaces up to 230 degrees C and for surfaces exposed to the weather. Color of the finish coat shall be light gray.

#### 2.14.9.13 Pressure Gauge

Gauge shall conform to ASME B40.1. Gauge shall be single style pressure gauge for fuel with 115 mm dial, have brass or aluminum case, bronze tube, stainless steel ball valve, pressure snubbers, and scale range for the intended service.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Storage tanks shall be handled with extreme care to prevent damage during placement and shall be installed in accordance with the manufacturer's installation instructions and NFPA 30 or NFPA 30A, as applicable. The exterior surface of each tank shall be inspected for obvious visual damage prior to and proceeding the placement of each storage tank. Surface damage to a storage tank shall be corrected according manufacturer's requirements before proceeding with the system installation.

##### 3.1.1 Belowground Storage Tank

###### 3.1.1.1 Steel Tank Handling

Storing, handling, and placing of coated steel tanks shall be done with care and in a manner that will minimize damage to the coating and will not reduce its protective value. A coated tank shall be placed in position carefully and with a minimum of handling. Coating damage shall be repaired and tested as previously specified before backfilling.

###### 3.1.1.2 Steel Tank Installation Procedures

Tank shall be anchored to a reinforced concrete anchor pad as indicated through the use of manufacturer's supplied holddown straps. Tank shall be separated from an anchor pad by a minimum of 300 mm of backfill material.

Metal straps, turnbuckles, anchors, and accessories shall be coated to resist corrosion. Holiday testing of protective coatings for steel tanks shall be successfully completed prior to any backfilling, strapping, or piping connections to the tank. Backfill material shall be uniformly placed around the entire tank and extend to grade level. Tank anodes shall be inspected to ensure integrity during backfill operations.

### 3.1.1.2 Equipment

Equipment shall be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions. Supports shall be provided for equipment, appurtenances, and pipe as required. Floor-mounted pumps shall be provided with mechanical vibration isolators or a vibration isolation foundation. Anchors, bolts, nuts, washers, and screws shall be installed where required for securing the work in place. Sizes, types, and spacings of anchors and bolts not indicated or specified shall be as required for proper installation. Each dispenser and dispenser sump shall be installed in accordance with manufacturers' instructions. Dispensing units shall be isolated from the piping during flushing and cleaning operations.

### 3.1.1.3 Piping

Piping shall be inspected, tested, and approved before burying, covering, or concealing. Piping shall be installed straight and true to bear evenly on supports. Piping shall be free of traps, shall not be embedded in concrete pavement, and shall drain toward the corresponding storage tank. Any pipe, fittings, or appurtenances found defective after installation shall be replaced. Piping connections to equipment shall be as indicated or as required by the equipment manufacturer. Pipe and accessories shall be handled carefully to assure a sound, undamaged condition. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during installation. The pipe shall not be laid in water or stored outside unprotected when weather conditions are unsuitable. When work is not in progress, open ends of pipe and fittings shall be securely closed so that water, earth, or other substances cannot enter the pipe or fittings. Cutting pipe, when necessary, shall be done without damage to the pipe. Pipe shall be reamed to true internal diameter after cutting to remove burrs. Changes in pipe sizes shall be made through tapered reducing pipe fittings. Stainless steel pipe shall in no case be welded directly to carbon steel pipe. Fuel supply piping from a storage tank shall extend to within 150 mm of the tank's bottom.

#### 3.1.1.3.1 Aboveground Piping

Pipe sections shall be installed as indicated and be complete prior to performing any piping tests. FRP shall not be used aboveground.

#### 3.1.1.3.2 Belowground Piping

Nonmetallic pipe shall be installed in accordance with pipe manufacturer's instructions. Belowground piping shall be laid with a minimum pitch of 25 mm per 6 m. Horizontal sections of pipe shall be installed with a minimum of 450 mm of backfill between the top of the pipe and the ground surface. The full length of each section of belowground pipe shall rest solidly on the pipe bed. Joints in secondary piping shall not be made until inner pipe is successfully pressure tested.

#### 3.1.1.3.3 Pipe Hangers and Supports

Seismic requirements shall be in accordance with Sections 13080, SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT. Additional hangers and supports shall be installed for concentrated loads in piping between hangers and supports, such as for valves. Miscellaneous steel shapes as required shall be installed in accordance with ASTM A 36/A 36M. Pipe supports shall be installed in accordance with MSS SP-58 and MSS SP-69. Pipe spacing shall be as follows:

Nominal Pipe Size (mm)	25 and Under	40	50	80	100	150	200	250	300
Maximum Hanger Spacing (m)	2.1	2.7	3	3.7	4.3	5.2	5.8	6.7	7.0

#### 3.1.3.4 Pipe Sleeve

Piping passing through concrete or masonry construction shall be fitted with sleeves. Sleeve shall be of sufficient length to pass through the entire thickness of the associated structural member and be large enough to provide a minimum clear distance of 13 mm between the pipe and sleeve. Sleeves through concrete shall be 0.91 mm steel, fiberglass, or other material as approved by the Contracting Officer. Sleeves shall be accurately located on center with the piping and securely fastened in place. The space between a sleeve and a pipe shall be caulked and sealed as specified in Section 07900 JOINT SEALING. In fire walls and fire floors, both ends of a pipe sleeve shall be caulked with UL listed fill, void, or cavity material.

#### 3.1.3.5 Pipe Anchor

Where steel piping is to be anchored, the pipe shall be welded to the structural steel member of the anchor and the abraded area shall be patched with protective coating or covering as specified.

#### 3.1.3.6 Exterior Coating for Belowground Steel Pipe

Except as otherwise specified, protective coatings shall be applied mechanically in a factory or field plant especially equipped for the purpose. Valves and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand, preferably at the plant that applies the covering to the pipe. Joints shall be coated and wrapped by hand. Hand coating and wrapping shall be done in a manner and with materials that will produce a covering equal in thickness to that of the covering applied mechanically. Piping installed in valve boxes or manholes shall also receive the specified protective coating.

- a. Regular Surfaces, Fittings, and Couplings: Tape shall be initially stretched sufficiently to conform to the surface to which it is applied, using one layer lapped at least 25 mm. Tape shall overlap the extruded polyethylene coated piping 75 mm at all joints. A second layer, lapped at least 25 mm, with a tension as it comes off the roll shall be applied and pressed to conform to the shape of the component.
- b. Damaged Areas of Extruded Polyethylene Coating: Residual material from coating shall be pressed into the break or trimmed off. Tape shall be applied spirally and one-half lapped as it is applied. Tape shall extend 75 mm beyond the damaged area. A double wrap of

one full width of tape shall be applied at right angles to the pipe axis in a manner to seal each end of the spiral wrapping.

- c. Existing Piping Affected by the Contractor's Operation: Pipe shall be wrapped to 75 mm beyond the point of connection.

#### 3.1.4 Buried Utility Tape

Bury tape with the printed side up at a depth of 300 mm below the top surface of earth or the top surface of the subgrade under pavements.

#### 3.1.5 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory, shall be painted and have identification markings applied as specified in Section 09900 PAINTING, GENERAL. Stainless steel and aluminum surfaces shall not be painted. Prior to any painting, surfaces shall be cleaned to remove dust, dirt, rust, oil, and grease.

#### 3.1.6 Framed Instructions

Framed instructions shall include equipment layout, wiring and control diagrams, piping, valves, control sequences, and typed condensed operation instructions. The condensed operation instructions shall include preventative maintenance procedures, methods of checking the system for normal and safe operation, and procedures for safely starting and stopping the system. The framed instructions shall be framed under glass or laminated plastic and be posted where directed by the Contracting Officer. The framed instructions shall be posted before acceptance testing of the system.

### 3.2 TESTS

#### 3.2.1 Aboveground Storage Tank Tightness Tests

A tightness test shall be performed on each aboveground storage tank. The tests shall be performed prior to making piping connections. Tests shall be capable of detecting a 0.1 mL/s (0.1 gph) leak rate from any portion of the tank while accounting for effects of thermal expansion or contraction. Gauges used in the tightness tests shall have a scale with a maximum limit of 69 kPa. Each storage tank shall be pressurized with air to 35 kPa and monitored for a drop in pressure over a 2-hour period during which there shall be no drop in pressure in the tank greater than that allowed for pressure variations due to thermal effects. This pressure shall be maintained and soapsuds or equivalent material applied to the exterior of the tank. While applying the soapsuds, the entire tank shall be visually inspected, including the bottom surfaces, for leaks (bubble formations). Leaks discovered during either the 2-hour waiting period or the soapsuds tests shall be repaired in accordance with manufacturer's instructions. The pneumatic test shall be performed again in the event a leak is discovered.

#### 3.2.2 Belowground Storage Tank Tightness Tests

##### 3.2.2.1 Pneumatic Test

Pneumatically pressurize each storage tank's primary chamber to 35 kPa and monitor for a drop in pressure over a 2-hour period during which there

shall be no drop in pressure in the tank greater than that allowed for thermal expansion and contraction. Following the 2-hour period, the pressure from the primary chamber shall then be bled over into the interstitial space. This pressure shall be maintained and soapsuds or equivalent material applied to the exterior of the tank. While applying the soapsuds, the entire tank shall be visually inspected, including the bottom surfaces, for leaks (bubble formations). Leaks discovered in either the primary chamber or the interstitial space shall be repaired in accordance with manufacturer's instructions. The entire pneumatic test shall be performed again in the event a leak is discovered. Gauges used in pneumatic tests shall have a scale with a maximum limit of 69 kPa.

#### 3.2.2.2 Brine Level Test

The interstitial space of each tank shall be completely filled with a brine solution. A riser pipe shall be connected to the interstitial space which shall allow the solution to rise up within the riser at least 300 mm. After filling the interstitial space, the tank shall set approximately 3 hours. Following the 3-hour period the Contractor shall measure and record the level of solution within the riser. After a subsequent 4-hour period, the Contractor shall again measure and record the level of solution within the riser. If the level of solution within the interstitial decreases anytime during the test, the tank is considered leaking and therefore fails the test. If a tank is considered to leak, the tank shall be repaired according to manufacturer's recommendations and a tightness test performed again.

#### 3.2.3 Manufacturer's Tank Tests

Following the tank tightness test, each storage tank shall be leak tested in accordance with the manufacturer's written test procedure if the manufacturer's test procedure is different from the tightness tests already performed. Any test failure shall require corrective action and retest.

#### 3.2.4 Belowground Steel Tank Exterior Coating Tests

##### 3.2.4.1 Holiday Tests

Exterior surfaces, including the bottom surfaces, of each belowground steel storage tank shall have a holiday test performed using an electric holiday detector with an impressed current in accordance with NACE RP0274. The required voltage for the holiday test of STI P3 coatings shall be based on the coating thickness and ASTM G 62 Method A. The required voltage for the holiday test of FRP coatings shall be based on the coating thickness, ASTM G 62 Method B, and NACE RP0274. The holiday detector shall be equipped with an audible signal. Holidays in the protective covering shall be repaired and retested.

##### 3.2.4.2 Thickness Tests

For belowground steel tanks using a FRP coating system, the thickness of the coating shall be tested by non-destructive means in at least 100 evenly spaced locations around the tank. Areas with insufficient thickness shall be repaired with materials identical to those used originally, and after drying, shall be tested again for thickness. The entire tank shall be tested including the bottom surfaces.

#### 3.2.5 Exterior Coating for Belowground Steel Piping

The coating system shall be visually inspected for holes, voids, cracks, and other damage during installation. Damage to the protective coating incurred during transit and handling shall be repaired before installation.

Before lowering into the trench, each pipe section shall be tested by an electric holiday detector with impressed current in accordance with NACE RP0274 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. Holidays in the protective coating shall be repaired immediately upon detection and retested. The holiday detector shall be a type that field adjustments cannot be made. Calibration of the tester shall be performed by an independent testing manufacturer at 6-month intervals or at such time as the crest voltage is questionable. Following installation, but prior to filling the system with fuel, all exterior protective coatings, including field joints, shall be retested with an electric holiday detector as described above. Holidays in the protective coating shall be repaired immediately upon detection and retested. Extreme care shall be taken in lifting the piping to perform the testing procedure. Chains or metal ropes shall not be used in lifting the pipe for testing. Labor, materials, and equipment necessary for conducting the holiday tests shall be furnished by the Contractor.

### 3.2.6 Omitted

### 3.2.7 Piping Pneumatic and Hydrostatic Tests

Testing shall comply with the applicable requirements of ASME B31.3, NFPA 30, and the requirements specified herein. Care shall be taken not to exceed pressure rating of various fittings. Hydrostatic testing shall be performed using fuel as the liquid. Water shall not be introduced into the system for testing. To facilitate the pneumatic and hydrostatic tests, various sections of the piping system may be isolated and tested separately. Where such sections terminate at flanged valve points, the line shall be closed by means of blind flanges in lieu of relying on the valve. Tapped flanges shall be provided to allow a direct connection between the piping and the air compressor and/or pressurizing pump. Tapped flanges shall also be used for gauge connections. Taps in the permanent line will not be permitted. Gauges shall be subject to testing and approval. In the event leaks are detected, the pipe shall be repaired and the test repeated. Following satisfactory completion of each pneumatic and hydrostatic test, the pressure shall be relieved and the pipe immediately sealed. Provision shall be made to prevent displacement of the piping during testing. Personnel shall be kept clear of the piping during pneumatic testing. Equipment such as pumps, tanks, and meters shall be isolated from the piping system during the testing.

#### 3.2.7.1 Pneumatic Procedures for Product and Vent/Vapor Piping

Piping to be installed underground shall not receive field applied covering at the joints or be covered by backfill until the piping has passed the pneumatic test described herein. A pneumatic test pressure shall be applied in increments. A preliminary 170 kPa test shall be applied. The pressure shall be maintained while soapsuds or equivalent materials are applied to the exterior of the piping. While applying the soapsuds, the entire run of piping, including the bottom surfaces, shall be visually inspected for leaks (bubble formations). Leaks discovered shall be repaired in accordance with manufacturer's instructions and retested. Following the preliminary test, the piping shall be tested at a pressure of 340 kPa for not less than 2 hours, during which time there shall be no drop in pressure in the pipe greater than that allowed for thermal expansion and

contraction. The pressure source shall be disconnected during the final test period. Any leaks revealed by the test shall be repaired and the test repeated.

### 3.2.8 System Performance Tests

After all components of the system have been properly adjusted, the system shall be tested to demonstrate that the system meets the performance requirements for which it was designed. The maximum rated capacity of the system shall be tested by using several tank trucks simultaneously, if applicable. The use of tank trucks shall be coordinated with the Contracting Officer prior to testing. If any portion of the system or any piece of equipment fails to pass the tests, the Contractor shall make the necessary repairs or adjustments and the test shall be repeated until satisfactory performance is obtained from the Contracting Officer. The tests shall demonstrate the following:

- a. The capability of each fuel pump to deliver the indicated flow of fuel.
- b. The alarm and control panels are operational and perform as designed.
- c. Each fuel meter is operating accurately.
- d. Vent piping is clear of debris and each pressure/vacuum relief vent is operating properly.

### 3.3 FLUSHING, CLEANING AND ADJUSTING

Following installation and equipment testing but prior to system performance testing, the following flushing, cleaning, and adjustments shall be performed.

#### 3.3.1 Preparations for Flushing

##### 3.3.1.1 Initial System Cleaning

The interior of each fuel storage tank shall be visually inspected and cleaned free of debris before filling. In the event of entry into a storage tank, the Contractor shall ensure a safe atmosphere exists. Contractor shall remove all preservatives and foreign matter from valves, line strainers, pumps, and other equipment coming in contact with fuel. No fuel will be delivered to the system until the Contractor has satisfactorily completed this initial system cleaning.

##### 3.3.1.2 Protection of Equipment

Temporary 40 mesh cone type strainers shall be installed in the suction line ahead of each fueling pump as well as ahead of each filter/separator. The strainers shall be constructed of the same material as the piping and shall be compatible with the fuel to be handled. The temporary strainers shall remain in place for a minimum of 14 days after system startup, after which time the Contractor shall remove the strainers and prepare the piping as intended for final system operation.

#### 3.3.2 System Flushing

##### 3.3.2.1 Initial Fuel Supply

Following the preparations for flushing, each storage tank shall be filled to a 25 percent capacity with the proper fuel according to the fueling system's final operational requirements. Following the initial fuel supply, each storage tank's fuel temperature and liquid level shall be measured and recorded. The liquid level shall be measured using a manual tank gauge.

#### 3.3.2.2 Omitted

#### 3.3.2.3 Truck Fill Stand Flushing

Fuel shall be pumped at the system's maximum design flow rate from a storage tank through the fuel supply piping, to the corresponding truck fill stand, and then into an empty tank truck. Periodic samples for inspection by the Contracting Officer shall be taken from the drawoff connection of each truck fill riser while the corresponding tank truck is filling. When a tank truck has been filled, the operation shall be discontinued until the tank truck has returned the fuel to the storage tank from which it was taken. The empty tank truck shall then be returned to the truck fill stand and the flushing operation resumed. This procedure shall be repeated until the fuel being delivered is acceptable to the Contracting Officer. Each truck fill stand shall be flushed in the exact same manner. During the flushing process, the strainer preceding the fueling meter shall be frequently cleaned.

#### 3.3.2.4 Disposal of Initial Fuel Supply

In the event the fuel contained in the piping system at the conclusion of the flushing operation is not considered by the Contracting Officer to be of satisfactory quality for the desired use, the Contractor shall be responsible for pumping out the entire fuel supply from the storage tanks and the piping system. The filter/separator and piping system shall be completely drained to the storage tank. Disposition of the fuel removed from the system shall be the responsibility of the Government.

#### 3.3.3 Cleaning Equipment

Upon completion of flushing operations, permanent strainers shall be removed, cleaned, and reinstalled. If the pressure differential across the filter/separator elements exceeds that recommended by the manufacturer, the elements shall be replaced with the spare set furnished with the unit.

#### 3.3.4 Initial System Adjustments

Following the flushing and cleaning operations, each system component shall be initially adjusted, if necessary, to meet the system's final operational requirements. The Government will deliver enough fuel to the storage tanks to enable the Contractor to make final adjustments to equipment and controls. Flow rates and pressures shall be adjusted as required to meet the indicated requirements. The sequence of control for each component shall be adjusted to meet the indicated system requirements. Following the initial system adjustments, the equipment tests shall be performed in order to determine any necessary final system adjustments.

#### 3.4 DEMONSTRATIONS

Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist



of a total of 8 hours of normal working time and shall start after the system is functionally completed but prior to final system acceptance. The field instructions shall cover all of the items contained in the operation and maintenance manuals as well as demonstrations of routine maintenance operations.

-- End of Section --

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## SECTION 13280

## ASBESTOS ABATEMENT

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## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |            |   |
|------------|---|
| ANSI Z9.2  | (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems |
| ANSI Z87.1 | (1989; Errata; Z87.1a) Occupational and Educational Eye and Face Protection             |
| ANSI Z88.2 | (1992) Respiratory Protection   |

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- |             |  |
|-------------|--|
| ASTM D 1331 | (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents     |
| ASTM D 4397 | (1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications |
| ASTM E 1368 | (1997) Visual Inspection of Asbestos Abatement Projects                                  |

## CODE OF FEDERAL REGULATIONS (CFR)

- |             |   |
|-------------|---|
| 29 CFR 1910 | Occupational Safety and Health Standards                  |
| 29 CFR 1926 | Safety and Health Regulations for Construction            |
| 40 CFR 61   | National Emissions Standards for Hazardous Air Pollutants |
| 40 CFR 763  | Asbestos  |
| 42 CFR 84   | Approval of Respiratory Protective Devices                |
| 49 CFR 107  | Hazardous Materials Program Procedures                    |
| 49 CFR 171  | General Information, Regulations and Definitions          |

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

49 CFR 173 Shippers - General Requirements for Shipments and Packagings

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7 (1990) Compressed Air for Human Respiration

CGA G-7.1 (1989) Commodity Specification for Air

GEORGIA DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL PROTECTION DIVISION

Chap.391-3-14 (JUNE 1996) Asbestos Removal and Encapsulation

Chap. 391-3-14 (Revision, June 1998 with April 1999 Guidance Letter) Asbestos Notification Requirements for Demolition, Renovation or Abatement Projects

ENGINEERING MANUALS (EM)

EM 385-1-1 (1996) Safety and Health Requirements Manual

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90-018 (1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance

EPA 340/1-90-019 (1990) Asbestos/NESHAP Adequately Wet Guidance

EPA 560/5-85-024 (1985) Guidance for Controlling Asbestos-Containing Materials in Buildings

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (1996) Methods of Fire Test for Flame-Resistant Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 84-100 (1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996) High-Efficiency, Particulate, Air Filter Units

1.2 DEFINITIONS

- a. Adequately Wet: A term defined in 40 CFR 61, Subpart M, and EPA 340/1-90-019 meaning to sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are

observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wetted.

- b. Aggressive Method: Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact asbestos-containing material (ACM).
- c. Amended Water: Water containing a wetting agent or surfactant with a surface tension of at least 29 dynes per square centimeter when tested in accordance with ASTM D 1331.
- d. Asbestos: Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.
- e. Asbestos-Containing Material (ACM): Any materials containing more than one percent asbestos.
- f. Asbestos Fiber: A particulate form of asbestos, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.
- g. Authorized Person: Any person authorized by the Contractor and required by work duties to be present in the regulated areas.
- h. Building Inspector: Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- i. Certified Industrial Hygienist (CIH): An Industrial Hygienist certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.
- j. Class I Asbestos Work: Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.
- k. Class II Asbestos Work: Activities defined by OSHA involving the removal of ACM, which is not thermal system insulation, or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements when they are still intact are excluded from Class II asbestos work. Removal of small amounts of these materials that would fit into a glovebag may be classified as a Class III job.
- l. Class III Asbestos Work: Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above the ceiling, where asbestos is actively disturbed or asbestos-containing debris is actively disturbed.
- m. Class IV Asbestos Work: Maintenance and custodial construction

activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.

- n. Clean room: An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
- o. Competent Person: In addition to the definition in 29 CFR 1926, Section .32(f), a person who is capable of identifying existing asbestos hazards as defined in 29 CFR 1926, Section .1101, selecting the appropriate control strategy, has the authority to take prompt corrective measures to eliminate them and has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- p. Contractor/Supervisor: Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.
- q. Critical Barrier: One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area from migrating to an adjacent area.
- r. Decontamination Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.
- s. Demolition: The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.
- t. Disposal Bag: A 0.15 mm thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926, Section .1101, used for transporting asbestos waste from containment to disposal site.
- u. Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in 1 standard sized glovebag or waste bag, not larger than 1.5 m in length and width in order to access a building component.
- v. Equipment Room or Area: An area adjacent to the regulated area used for the decontamination of employees and their equipment.
- w. Employee Exposure: That exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.
- x. Fiber: A fibrous particulate, 5 micrometers or longer, with a length to width ratio of at least 3 to 1.



- y. Friable ACM: A term defined in 40 CFR 61, Subpart M and EPA 340/1-90-018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent, as determined by a method other than point counting by PLM, the asbestos content is verified by point counting using PLM.
- z. Glovebag: Not more than a 1.5 by 1.5 m impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- aa. High-Efficiency Particulate Air (HEPA) Filter: A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.
- bb. Homogeneous Area: An area of surfacing material or thermal system insulation that is uniform in color and texture.
- cc. Industrial Hygienist: A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.
- dd. Intact: ACM which has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render the ACM non-intact simply by being separated into smaller pieces.
- ee. Model Accreditation Plan (MAP): USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763, Subpart E, Appendix C.
- ff. Modification: A changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system.
- gg. Negative Exposure Assessment: A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).
- hh. NESHAP: National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61, Subpart M.
- ii. Nonfriable ACM: A NESHAP term defined in 40 CFR 61, Subpart M and EPA 340/1-90-018 meaning any material containing more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.
- jj. Nonfriable ACM (Category I): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90-018 meaning asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing

products containing more than 1 percent asbestos as determined using the method specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

- kk. Nonfriable ACM (Category II): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90-018 meaning any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos, as determined using the methods specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- ll. Permissible Exposure Limits (PELs):
- (1) PEL-Time weighted average (TWA): Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8 hour time weighted average (TWA), as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
- (2) PEL-Excursion Limit: An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.
- mm. Regulated Area: An OSHA term defined in 29 CFR 1926, Section .1101 meaning an area established by the Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also any adjoining area where debris and waste from such asbestos work accumulate; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.
- nn. Removal: All operations where ACM is taken out or stripped from structures or substrates, and includes demolition operations.
- oo. Repair: Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM attached to structures or substrates. If the amount of asbestos so "disturbed" cannot be contained in 1 standard glovebag or waste bag, Class I precautions are required.
- pp. Spills/Emergency Cleanups: Cleanup of sizable amounts of asbestos waste and debris which has occurred, for example, when water damage occurs in a building, and sizable amounts of ACM are dislodged. A Competent Person evaluates the site and ACM to be handled, and based on the type, condition and extent of the dislodged material, classifies the cleanup as Class I, II, or III. Only if the material was intact and the cleanup involves mere contact of ACM, rather than disturbance, could there be a Class IV classification.
- qq. Surfacing ACM: Asbestos-containing material which contains more than 1% asbestos and is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

- rr. Thermal system insulation (TSI) ACM: ACM which contains more than 1% asbestos and is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.
- ss. Transite: A generic name for asbestos cement wallboard and pipe.
- tt. Worker: Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926, Section .1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

### 1.3 DESCRIPTION OF WORK

The work covered by this section includes the removal of asbestos-containing materials (ACM) which are encountered during demolition activities associated with this project and describes procedures and equipment required to protect workers and occupants of the regulated area from contact with airborne asbestos fibers and ACM dust and debris.

Activities include OSHA Class I and Class II work operations involving ACM.

The work also includes containment, storage, transportation and disposal of the generated ACM wastes. More specific operational procedures shall be detailed in the required Accident Prevention Plan and its subcomponents, the Asbestos Hazard Abatement Plan and Activity Hazard Analyses required in paragraph SAFETY AND HEALTH PROGRAM AND PLANS.

#### 1.3.1 Abatement Work Tasks

The specific ACM to be abated is identified on the detailed survey plans and project drawings prepared by the Supervisor of Shipbuilding, Conversion & Repair USN, Portsmouth Va., Environmental Detachment Charleston, Charleston NC. This report is included as Appendix C to the specifications; however, only selected buildings from this survey are applicable to this project. These buildings are: 1213, 1214, 1215, 1216, 1217, 1218, 1227, 1229, 1230, 1231, 1235, 1236, 1248, 1251, 1259 and 1260. In addition to buildings in the 1200 block, one building, in the 200/300 block will also be abated. It is Building 223. The asbestos survey report prepared by Air-Safe Environmental, Inc, is also included in Appendix C. A summary of work task data elements for each individual ACM abatement work task is included in Table 1, "Individual Work Task Data Elements" at the end of this section. Please note that there are known vague or mis-reported areas in the survey. Assumptions have been made by the designer. All contradictions between the survey report and the Table I should be brought to the attention of the COR before, and no later than at the pre-construction meeting to eliminate any misunderstanding. The survey report may be attached to the specifications, if not it will be made available on request to the project manager.

The RESPONSE ACTION DETAIL SHEET (item to be abated and methods to be used) and SET-UP DETAIL SHEETS (containment techniques to include safety precautions and methods) that are referenced, can be accessed on the Huntsville Website at: [Huntsville.Engineering.and.Support.Center.www.hnd.usace.army.mil](http://Huntsville.Engineering.and.Support.Center.www.hnd.usace.army.mil) TECHINFO. In preparing the abatement plan actual sheets shall be included. Referencing the sheets' numbers will not be acceptable.

### 1.3.2 Unexpected Discovery of Asbestos

For any previously untested, (excluding areas assumed positive), building components suspected to contain asbestos and located in areas impacted by the work, the Contractor shall notify the Contracting Officer (CO) who will have the option of ordering up to 15 bulk PCM samples and 8 TEM bulk samples to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM at no additional cost to the Government. Note that PCM can only be used to identify positive for asbestos and not negative if the material is in a bound matrix such as vinyl tile, mastic or gummy sealant. Any additional components identified as ACM that have been approved by the Contracting Officer for removal shall be removed by the Contractor and will be paid for by an equitable adjustment to the contract price under the CONTRACT CLAUSE titled "changes". Sampling activities undertaken to determine the presence of additional ACM shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course required by 40 CFR 763, Subpart E, Appendix C.

### 1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. GA|D indicates an engineering design review level. GA|D level asbestos submittals are reviewed by the Savannah District Safety and Occupational Health Office, or by an industrial hygienist designated by that office. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

All pre-work submittals are to be bound into one volume under the title "Asbestos Hazard Abatement and Control Plan"(AHACP). The AHACP is an GA|D level review submittal.

Materials and Equipment; GA|D.

Manufacturer's catalog data for all materials and equipment to be used in the work, including brand name, model, capacity, performance characteristics and any other pertinent information. Test results and certificates from the manufacturer of encapsulants substantiating compliance with performance requirements of this specification. Material Safety Data Sheets for all chemicals to be used onsite in the same format as implemented in the Contractor's HAZARD COMMUNICATION PROGRAM. Both the oversight firm (CIH) and the abatement firm (CIH) shall submit the following data. Data shall include, but shall not be limited to, the following items:

- a. High Efficiency Filtered Air (HEPA) local exhaust equipment
- b. Vacuum cleaning equipment
- c. Pressure differential monitor for HEPA local exhaust equipment
- d. Air monitoring equipment

- e. Respirators
- f. Personal protective clothing and equipment
  - (1) Coveralls
  - (2) Underclothing
  - (3) Other work clothing
  - (4) Foot coverings
  - (5) Hard hats
  - (6) Eye protection
  - (7) Other items required and approved by Contractors Designated IH and Competent Person
- g. Glovebag
- h. Duct Tape
- i. Disposal Containers
  - (1) Disposal bags
  - (2) Fiberboard drums
  - (3) Paperboard boxes
- j. Sheet Plastic
  - (1) Polyethylene Sheet - General
  - (2) Polyethylene Sheet - Flame Resistant
  - (3) Polyethylene Sheet - Reinforced
- k. Wetting Agent
  - (1) Amended Water
  - (2) Removal encapsulant
- l. Strippable Coating
- m. Prefabricated Decontamination Unit
- n. Other items
- o. Chemical encapsulant
- p. Chemical encasement materials
- q. Material Safety Data Sheets (for all chemicals proposed)

## SD-04 Drawings

## Site Layout; GA|D

Descriptions, detail project drawings, and site layout to include worksite containment area techniques as prescribed on applicable SET-UP DETAIL SHEETS, local exhaust ventilation system locations, decontamination and load-out units, other temporary waste storage facility, access tunnels, location of temporary utilities (electrical, water, sewer) and boundaries of each regulated area.

## SD-08 Statements

## Qualifications; GA|D

Submit a written report providing evidence of qualifications for personnel, facilities and equipment assigned to the work. The Contractor shall furnish a written qualifications and organization report as stated in Section 1.5.1 Written Qualification and Organization Report. The Qualification Report shall include, in separate submittals, the qualifications of the abatement firm personnel and the oversight (CIH) firm. Evidence includes copies of: state licenses, trainer signed and dated training certificates, signed physicians' statements, legible dusty trades cards, training and experience resume, etc.

## Training Program; GA|D.

A copy of the written project site-specific training material as indicated in 29 CFR 1926, Section .1101 that will be used to train onsite employees. The training document shall be signed by the Contractor's Designated IH and Competent Person.

## Medical Requirements; GA|D.

Physician's written opinion. . Evidence includes copies of: State licenses, trainer signed and dated training certificates, signed physicians' statements, legible dusty trades cards, etc.

## Encapsulants; GA|D.

Certificates stating that encapsulants meet the applicable specified performance requirements.

## SD-09 Reports

## Exposure Assessment and Air Monitoring; GA|D

Initial exposure assessments, negative exposure assessments, air-monitoring results and documentation. This shall be provided separately by both the abatement firm (CIH) and the oversight firm (CIH).

## Local Exhaust Ventilation; GA|F.

Pressure differential recordings.

## Licenses, Permits and Notifications; GA|F.

Includes copies of Federal, State or local licenses and notifications, permits to discharge water and any other asbestos associated license, permit and notification.

Licenses, permits, and notifications.

## SD-13 Certificates

## Vacuum, Filtration and Ventilation Equipment; FIO.

Manufacturer's certifications showing compliance with ANSI Z9.2 for:

- a. Vacuums.
- b. Water filtration equipment.

- c. Ventilation equipment.
- d. Other equipment required to contain airborne asbestos fibers.

#### SD-18 Records

Respiratory Protection Program; GA|D.

Records of the respirator program; types used, fit tests and equipment, cleaning and repair documentation, site storage, etc.

Cleanup and Disposal; GA.

Waste shipment records. Weigh bills and delivery tickets shall be furnished for information only. All copies shall be legible and contain all signatures and dates.

### 1.5 QUALIFICATIONS

#### 1.5.1 Written Qualifications and Organization Report

The Contractor shall furnish a written qualifications and organization report providing evidence of qualifications of the Contractor, Contractor's Project Supervisor, Designated Competent Person, supervisors and workers; Designated IH (person assigned to project and firm name); independent testing laboratory (including name of firm, principal, and analysts who will perform analyses); all subcontractors to be used including disposal transportation and disposal facility firms, subcontractor supervisors, subcontractor workers; and any others assigned to perform asbestos abatement and support activities. The report shall include an organization chart showing the Contractor's staff organization for this project by name and title, chain of command and reporting relationship with all subcontractors. The report shall be signed by the Contractor, the Contractor's onsite project manager, Designated Competent Person, Designated IH, designated testing laboratory and the principals of all subcontractors to be used. The Contractor shall include the following statement in the report: "By signing this report I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and the Federal, State and local requirements specified in paragraph SAFETY AND HEALTH PROGRAM AND PLANS for those asbestos abatement activities that they will be involved in."

#### 1.5.2 Specific Requirements

The Contractor shall designate in writing, personnel meeting the following qualifications:

- a. Designated Competent Person: The name, address, telephone number, and resume of the Contractor's Designated Competent Person shall be provided. Evidence that the full-time Designated Competent Person is qualified in accordance with 29 CFR 1926, Sections .32 and .1101, has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and is experienced in the administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up

and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The duties of the Competent Person shall include the following: controlling entry to and exit from the regulated area; supervising any employee exposure monitoring required by 29 CFR 1926, Section .1101; ensuring that all employees working within a regulated area wear the appropriate personal protective equipment (PPE), are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating conditions and are functioning properly. The Designated Competent Person shall be responsible for compliance with applicable Federal, State and local requirements, the Contractor's Accident Prevention Plan and Asbestos Hazard Abatement Plan. The Designated Competent Person shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that this person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. Evidence shall include the name, address and telephone number of non-company personnel who can verify the submitted information. The Designated Competent Person shall be onsite at all times during the conduct of this project.

- b. Project and Other Supervisors: The Contractor shall provide the name, address, telephone number, and resume of the Project Supervisor and other supervisors who have responsibility to implement the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses, the authority to direct work performed under this contract and verify compliance, and have EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C. The Project Supervisor and other supervisors shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that the Project Supervisor has a minimum of 1 years of on-the-job asbestos abatement experience relevant to project supervisor responsibilities and the other supervisors have a minimum of 1 year on-the-job asbestos abatement experience commensurate with the responsibilities they will have on this project.
- c. Designated Industrial Hygienist: The Contractor shall provide the name, address, telephone number, resume and other information specified below for the Industrial Hygienist (IH) selected to prepare the Contractor's Asbestos Hazard Abatement Plan, prepare and perform training, direct air monitoring and assist the Contractor's Competent Person in implementing and ensuring that safety and health requirements are complied with during the performance of all required work. The Designated IH shall be a person who is board certified in the practice of industrial



hygiene as determined and documented by the American Board of Industrial Hygiene (ABIH) or board certified in the practice of safety as determined and documented by the Board of Certified Safety Professionals (BCSP)), has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and has a minimum of 2 years of comprehensive experience in planning and overseeing asbestos abatement activities. The Designated IH shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Designated IH shall be completely independent from the Contractor according to Federal, State, or local regulations; that is, shall not be a Contractor's employee or be an employee or principal of a firm in a business relationship with the Contractor negating such independent status. A copy of the Designated IH's current valid ABIH or BCSP certification shall be included. The Designated IH shall visit the site at least once per month for the duration of asbestos activities and shall be available for emergencies. In addition, the Designated IH shall prepare, and the Contractor shall submit, the name, address, telephone numbers and resumes of additional IH's and industrial hygiene technicians (IHT) who will be assisting the Designated IH in performing onsite tasks. IHs and IHTs supporting the Designated IH shall have a minimum of 2 years of practical, onsite, asbestos abatement experience. The formal reporting relationship between the Designated IH and the support IHs and IHTs, the Designated Competent Person, and the Contractor shall be indicated.

- d. Asbestos Abatement Workers: Asbestos abatement workers shall meet the requirements contained in 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and other applicable Federal, State and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment" in this paragraph.
- e. Worker Training and Certification of Worker Acknowledgment: Training documentation will be required for each employee who will perform OSHA Class I, Class II, Class III, or Class IV asbestos abatement operations. Such documentation shall be submitted on a Contractor generated form titled "Certificate of Workers Acknowledgment", to be completed for each employee in the same format and containing the same information as the example certificate at the end of this section. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.
- f. Physician: The Contractor shall provide the name, medical qualifications, address, telephone number and resume of the physician who will or has performed the medical examinations and evaluations of the persons who will conduct the asbestos abatement work tasks. The physician shall be currently licensed by the state where the workers will be or have been examined, have expertise in pneumoconiosis and shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1926, Section .1101 and paragraph MEDICAL REQUIREMENTS. The physician shall be familiar with the site's hazards and the scope of this

project.

- g. First Aid and CPR Trained Persons: The names of at least two persons who are currently trained in first aid and CPR by the American Red Cross or other approved agency shall be designated and shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030 and shall be included in the Contractor's Bloodborne Pathogen Program. These persons may perform other duties but shall be immediately available to render first aid when needed. A copy of each designated person's current valid First Aid and CPR certificate shall be provided.
- h. Independent Testing Laboratory: The Contractor shall provide the name, address and telephone number of the independent testing laboratory selected to perform the sample analyses and report the results. The testing laboratory shall be completely independent from the Contractor as recognized by Federal, State or local regulations. Written verification of the following criteria, signed by the testing laboratory principal and the Contractor, shall be submitted:
  - (1) Phase contrast microscopy (PCM): The laboratory is fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926, Section .1101, OSHA method ID-160, the most current version of NIOSH Pub No. 84-100 Method 7400, and NIOSH Pub No. 84-100 Method 7402, transmission electron microscopy (TEM); the laboratory is currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program; the names of the selected microscopists who will analyze airborne samples by PCM with verified documentation of their proficiency to conduct PCM analyses by being judged proficient in counting samples as current participating analysts in the AIHA PAT Program, and having successfully completed the Asbestos Sampling and Analysis course (NIOSH 582 or equivalent) with a copy of course completion certificate provided; when the PCM analysis is to be conducted onsite, documentation shall be provided certifying that the onsite analyst meets the same requirements.
  - (2) Polarized light microscopy (PLM): The laboratory is fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for bulk asbestos analysis and will use analysts (names shall be provided) with demonstrated proficiency to conduct PLM to include its application to the identification and quantification of asbestos content.
  - (3) Transmission electron microscopy (TEM): The laboratory is fully equipped and proficient in conducting TEM analysis of airborne samples using the mandatory method specified by 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for airborne sample analysis of asbestos by TEM; the laboratory will use analysts (names shall be provided) that are currently evaluated as competent with demonstrated

proficiency under the NIST NVLAP for airborne sample analysis of asbestos by TEM. The lab shall also be proficient in conducting analysis for low asbestos concentration, enhanced analysis of floor tiles and bulk materials where multiple layers are present, using an improved EPA test method titled, "Method for the Determination of Asbestos in Bulk Building Materials".

(4) PCM/TEM: The laboratory is fully equipped and each analyst (name shall be provided) possesses demonstrated proficiency in conducting PCM and TEM analysis of airborne samples using NIOSH Pub No. 84-100 Method 7400 PCM and NIOSH Pub No. 84-100 Method 7402 (TEM confirmation of asbestos content of PCM results) from the same filter.

- i. Disposal Facility, Transporter: The Contractor shall provide written evidence that the landfill to be used is approved for asbestos disposal by the USEPA and state of Georgia and local regulatory agencies. Copies of signed agreements between the Contractor (including subcontractors and transporters) and the asbestos waste disposal facility to accept and dispose of all asbestos containing waste generated during the performance of this contract shall be provided. Qualifications shall be provided for each subcontractor or transporter to be used, indicating previous experience in transport and disposal of asbestos waste to include all required state and local waste hauler requirements for asbestos. The Contractor and transporters shall meet the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. The disposal facility shall meet the requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61, Section .150(b), and other applicable State or local requirements. The waste transporter and disposal company shall not be permitted to bulk or otherwise save up asbestos waste materials off-site to be shipped en masse to the disposal landfill. All wastes will be taken directly from the site to the landfill.

#### 1.5.3 Federal, State or Local Citations on Previous Projects

The Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided.

#### 1.6 REGULATORY REQUIREMENTS

In addition to detailed requirements of this specification, work performed under this contract shall comply with EM 385-1-1, applicable Federal, State, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. This includes, but is not limited to, OSHA standards, 29 CFR 1926, especially Section .1101, 40 CFR 61, Subpart M and 40 CFR 763. Matters of interpretation of standards shall be submitted to the

appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply. The following state and local laws, rules and regulations regarding demolition, removal, encapsulation, construction alteration, repair, maintenance, renovation, spill/emergency cleanup, housekeeping, handling, storing, transporting and disposing of asbestos material apply: GEORGIA DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL PROTECTION DIVISION, Chap. 391-3-14, (JUNE 1996) Asbestos Removal and Encapsulation including all revisions such the revision made on June 1998 and documented with April 1999 Guidance Letter addressed, Notice to Contractors, and titled, "Asbestos Notification Requirements for Demolition, Renovation or Abatement Projects".

#### 1.7 SAFETY AND HEALTH PROGRAM AND PLANS

The Contractor shall develop and submit a written comprehensive site-specific Accident Prevention Plan at least 30 days prior to the preconstruction conference. The Accident Prevention Plan shall address requirements of EM 385-1-1, Appendix A, covering onsite work to be performed by the Contractor and subcontractors. The Accident Prevention Plan shall incorporate an Asbestos Hazard Abatement Plan, and Activity Hazard Analyses as separate appendices into 1 site specific Accident Prevention Plan document. Any portions of the Contractor's overall Safety and Health Program that are referenced in the Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as appendices to the Accident Prevention Plan. The plan shall take into consideration all the individual asbestos abatement work tasks identified in Table 1. The plan shall be prepared, signed (and sealed, including certification number if required), and dated by the Contractor's Designated IH, Competent Person, and Project Supervisor.

##### 1.7.1 Asbestos Hazard Control and Abatement Plan Appendix

The Asbestos Hazard Control and Abatement Plan appendix to the Accident Prevention Plan shall include, but not be limited to, the following:

- a. The personal protective equipment to be used;
- b. The location and description of regulated areas including clean and dirty areas, access tunnels, and decontamination unit (clean room, shower room, equipment room, storage areas such as load-out unit);
- c. Initial exposure assessment in accordance with 29 CFR 1926, Section .1101;
- d. Level of supervision;
- e. Method of notification of other employers at the worksite;
- f. Abatement method to include containment and control procedures;
- g. Interface of trades involved in the construction;
- h. Sequencing of asbestos related work;
- i. Storage and disposal procedures and plan;

- j. Type of wetting agent and asbestos encapsulant to be used;
- k. Location of local exhaust equipment;
- l. Air monitoring methods (personal, environmental and clearance);
- m. Bulk sampling and analytical methods (if required);
- n. A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber concentrations;
- o. Fire and medical emergency response procedures;
- p. The security procedures to be used for all regulated areas.
- q. Copies of all certifications and licenses.

#### 1.7.2 Activity Hazard Analyses Appendix

Activity Hazard Analyses, for each major phase of work, shall be submitted and updated during the project. The Activity Hazard Analyses format shall be in accordance with EM 385-1-1 (Figure 1-1). The analysis shall define the activities to be performed for a major phase of work, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the Activity Hazard Analyses has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite Government representatives. The Activity Hazard Analyses shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

#### 1.8 PRECONSTRUCTION CONFERENCE AND ONSITE SAFETY

The Contractor and the Contractor's Designated Competent Person, Project Supervisor, and Designated IH shall meet with the Contracting Officer prior to beginning work at a safety preconstruction conference to discuss the details of the Contractor's submitted Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses appendices. Deficiencies in the Accident Prevention Plan will be discussed and the Accident Prevention Plan shall be revised to correct the deficiencies and resubmitted for acceptance. Any changes required in the specification as a result of the Accident Prevention Plan or Asbestos Survey Report shall be identified specifically in the plan to allow for free discussion and acceptance by the Contracting Officer, prior to the start of work. Onsite work shall not begin until the Accident Prevention Plan has been accepted. A copy of the written Accident Prevention Plan shall be maintained onsite. Changes and modifications to the accepted Accident Prevention Plan shall be made with the knowledge and concurrence of the Designated IH, the Project Supervisor, Designated Competent Person, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Designated IH shall bring such hazard to the attention of the Project Supervisor, Designated Competent Person, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Once accepted by the Contracting Officer, the Accident Prevention Plan, including the Asbestos

Hazard Abatement Plan and Activity Hazard Analyses will be enforced as if an addition to the contract. Disregarding the provisions of this contract or the accepted Accident Prevention Plan will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

#### 1.9 SECURITY

Fenced and locked security area shall be provided for each regulated area. A log book shall be kept documenting entry into and out of the regulated area. Entry into regulated areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas shall be trained, be medically evaluated, and wear the required personal protective equipment, for the specific regulated area to be entered.

#### 1.10 MEDICAL REQUIREMENTS

Medical requirements shall conform to 29 CFR 1926, Section .1101.

##### 1.10.1 Medical Examinations

Before being exposed to airborne asbestos fibers, workers shall be provided with a medical examination as required by 29 CFR 1926, Section .1101 and other pertinent state or local requirements. This requirement shall have been satisfied within the last 12 months. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. X-ray films of asbestos workers shall be identified to the consulting radiologist and medical record jackets shall be marked with the word "asbestos."

##### 1.10.1.1 Information Provided to the Physician

The Contractor shall provide the following information in writing to the examining physician:

- a. A copy of 29 CFR 1926, Section .1101 and Appendices D, E, G, and I;
- b. A description of the affected employee's duties as they relate to the employee's exposure;
- c. The employee's representative exposure level or anticipated exposure level;
- d. A description of any personal protective and respiratory equipment used or to be used;
- e. Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

##### 1.10.1.2 Written Medical Opinion

For each worker, a written medical opinion prepared and signed by a licensed physician indicating the following:

- a. Summary of the results of the examination.

- b. The potential for an existing physiological condition that would place the employee at an increased risk of health impairment from exposure to asbestos.
- c. The ability of the individual to wear personal protective equipment, including respirators, while performing strenuous work tasks under cold and/or heat stress conditions.
- d. A statement that the employee has been informed of the results of the examination, provided with a copy of the results, informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure, and informed of any medical condition that may result from asbestos exposure.

#### 1.10.2 Medical and Exposure Records

Complete and accurate records shall be maintained of each employee's medical examinations, medical records, and exposure data, as required by 29 CFR 1910, Section .1910.20 and 29 CFR 1926, Section .1101 for a period of 50 years after termination of employment. Records of the required medical examinations and exposure data shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health (OSHA) or authorized representatives of the employee and an employee's physician upon request of the employee or former employee. A copy of the required medical certification for each employee shall be maintained on file at the worksite for review, as requested by the Contracting Officer or the representatives.

#### 1.11 TRAINING PROGRAM

##### 1.11.1 General Training Requirements

The Contractor shall establish a training program as specified by EPA Model Accreditation Plan (MAP), training requirements at 40 CFR 763, Subpart E, Appendix C, the State of Georgia regulation GEORGIA DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL PROTECTION DIVISION, Chap.391-3-14, (JUNE 1996) Asbestos Removal and Encapsulation including all revisions such the revision made on June 1998 and documented with April 1999 Guidance Letter addressed, Notice to Contractors, and titled, "Asbestos Notification Requirements for Demolition, Renovation or Abatement Projects"., OSHA requirements at 29 CFR 1926, Section .1101(k)(9), and this specification. Contractor employees shall complete the required training for the type of work they are to perform and such training shall be documented and provided to the Contracting Officer as specified in paragraph QUALIFICATIONS.

##### 1.11.2 Project Specific Training

Prior to commencement of work, each worker shall be instructed by the Contractor's Designated IH and Competent Person in the following project specific training:

- a. The hazards and health effects of the specific types of ACM to be abated;
- b. The content and requirements of the Contractor's Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses and site-specific safety and health precautions;

- c. Hazard Communication Program;
- d. Hands-on training for each asbestos abatement technique to be employed;
- e. Heat and/or cold stress monitoring specific to this project;
- f. Air monitoring program and procedures;
- g. Medical surveillance to include medical and exposure record-keeping procedures;
- h. The association of cigarette smoke and asbestos-related disease;
- i. Security procedures;
- j. Specific work practice controls and engineering controls required for each Class of work in accordance with 29 CFR 1926, Section .1101.

#### 1.12 RESPIRATORY PROTECTION PROGRAM

The Contractor's Designated IH shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926, Section .1101, 29 CFR 1910, Section .134, ANSI Z88.2, CGA G-7, CGA G-7.1 and DETAIL SHEET 12. The Contractor's Designated IH shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations encountered during the performance of the asbestos abatement work. The Contractor's respiratory protection program shall include, but not be limited to, the following elements:

- a. The company policy, used for the assignment of individual responsibility, accountability, and implementation of the respiratory protection program.
- b. The standard operating procedures covering the selection and use of respirators. Respiratory selection shall be determined by the hazard to which the worker is exposed.
- c. Medical evaluation of each user to verify that the worker may be assigned to an activity where respiratory protection is required.
- d. Training in the proper use and limitations of respirators.
- e. Respirator fit-testing, i.e., quantitative, qualitative and individual functional fit checks.
- f. Regular cleaning and disinfection of respirators.
- g. Routine inspection of respirators during cleaning and after each use when designated for emergency use.
- h. Storage of respirators in convenient, clean, and sanitary locations.
- i. Surveillance of regulated area conditions and degree of employee exposure (e.g., through air monitoring).



- j. Regular evaluation of the continued effectiveness of the respiratory protection program.
- k. Recognition and procedures for the resolution of special problems as they affect respirator use (e.g., no facial hair that comes between the respirator face piece and face or interferes with valve function; prescription eye wear usage; contact lenses usage; etc.).
- l. Proper training in putting on and removing respirators.

#### 1.12.1 Respiratory Fit Testing

A qualitative or quantitative fit test conforming to 29 CFR 1926, Section 1101, Appendix C shall be conducted by the Contractor's Designated IH for each Contractor worker required to wear a respirator, and for the Contracting Officer and authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test shall be performed for each worker wearing a negative-pressure respirator prior to initially wearing a respirator on this. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which half-facepiece air purifying respirators are permitted. Copies of all fit test records shall be submitted with the copy of the Respiratory Protection Program. If physical changes develop that will affect the fit, a new fit test for the worker shall be performed.

Functional fit checks shall be performed by employees each time a respirator is put on and in accordance with the manufacturer's recommendation.

#### 1.12.2 Respirator Selection and Use Requirements

The Contractor shall provide respirators, and ensure that they are used as required by 29 CFR 1926, Section .1101 and in accordance with the manufacturer's recommendations. Respirators shall be jointly approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (MSHA/NIOSH), or by NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. Personnel who handle ACM, enter regulated areas that require the wearing of a respirator, or who are otherwise carrying out abatement activities that require the wearing of a respirator, shall be provided with approved respirators that are fully protective of the worker at the measured or anticipated airborne asbestos concentration level to be encountered. For air-purifying respirators, the particulate filter portion of the cartridges or canister approved for use in airborne asbestos environments shall be high-efficiency particulate air (formerly called HEPA) and be 99.9% efficient. The respiratory protection program for this site shall state whether P-100, R-100, or N-100 cartridges will be used. The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type shall be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered. Recommendations made by the Contractor's Designated IH to downgrade respirator type shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person in consultation with the Designated IH, shall have the authority to take immediate action to upgrade or downgrade respiratory type when there is an immediate danger to the health and safety of the wearer. Respirators shall be used in the following circumstances:

- a. During all Class I asbestos jobs.
- b. During all Class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II and III work which is not performed using wet methods. Respirators need not be worn during removal of ACM from sloped roofs when a negative exposure assessment has been made and ACM is removed in an intact state.
- d. During all Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment.
- e. During all Class III jobs where TSI or surfacing ACM is being disturbed.
- f. During all Class IV work performed within regulated areas where employees performing other work are required to wear respirators.
- g. During all work where employees are exposed above the PEL-TWA or PEL-Excursion Limit.
- h. In emergencies

#### 1.12.3 Class I Work

The Contractor shall provide: (1) a tight-fitting, powered air purifying respirator equipped with high efficiency filters, or (2) a full-facepiece supplied air respirator operated in the pressure demand mode, equipped with 99.9% efficient (formerly HEPA) egress cartridges, or (3) an auxiliary positive pressure self-contained breathing apparatus, for all employees within the regulated area where Class I work is being performed; provided that a negative exposure assessment has not been produced, and that the exposure level will not exceed 1 f/cc as an 8-hour time weighted average. A full-facepiece supplied air respirator, operated in the pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1 f/cc as an 8-hour time weighted average.

#### 1.12.4 Class II and III Work

The Contractor shall provide an air purifying respirator, other than a disposable respirator, equipped with high-efficiency filters (99.9%) whenever the employee performs Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment; and Class III jobs where TSI or surfacing ACM is being disturbed.

#### 1.12.5 Sanitation

Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

#### 1.13 HAZARD COMMUNICATION PROGRAM

A hazard communication program shall be established and implemented in accordance with 29 CFR 1926, Section .59. Material safety data sheets (MSDSs) shall be provided for all hazardous materials brought onto the

worksite. One copy shall be provided to the Contracting Officer and 1 copy shall be included in the Contractor's Hazard Communication Program.

#### 1.14 LICENSES, PERMITS AND NOTIFICATIONS

##### 1.14.1 General Legal Requirements

Necessary licenses, permits and notifications shall be obtained in conjunction with the project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by Federal, State, regional, and local authorities. The Contractor shall notify the State's environmental protection agency responsible for asbestos air emissions and the Contracting Officer in writing, at least 10 days prior to the commencement of work, in accordance with 40 CFR 61, Subpart M, and state and local requirements to include the mandatory "Notification of Demolition and Renovation Record" form and other required notification documents. Notification shall be by Certified Mail, Return Receipt Requested. The Contractor shall furnish copies of the receipts to the Contracting Officer, in writing, prior to the commencement of work. Local fire department shall be notified 3 days before fire-proofing material is removed from a building and the notice shall specify whether or not the material contains asbestos. A copy of the rental company's written acknowledgment and agreement shall be provided as required by paragraph RENTAL EQUIPMENT. For licenses, permits, and notifications that the Contractor is responsible for obtaining, the Contractor shall pay any associated fees or other costs incurred.

##### 1.14.2 Litigation and Notification

The Contractor shall notify the Contracting Officer if any of the following occur:

- a. The Contractor or any of the subcontractors are served with notice of violation of any law, regulation, permit or license which relates to this contract;
- b. Proceedings are commenced which could lead to revocation of related permits or licenses; permits, licenses or other Government authorizations relating to this contract are revoked;
- c. Litigation is commenced which would affect this contract;
- d. The Contractor or any of the subcontractors become aware that their equipment or facilities are not in compliance or may fail to comply in the future with applicable laws or regulations.

#### 1.15 PERSONAL PROTECTIVE EQUIPMENT

Three complete sets of personal protective equipment shall be made available to the Contracting Officer and authorized visitors for entry to the regulated area. Contracting Officer and authorized visitors shall be provided with training equivalent to that provided to Contractor employees in the selection, fitting, and use of the required personal protective equipment and the site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and the Contractor shall ensure that it is worn properly. The Contractor's Designated IH and Designated Competent Person shall select and approve all the required personal protective clothing and equipment to be used.

#### 1.15.1 Respirators

Respirators shall be in accordance with paragraph RESPIRATORY PROTECTION PROGRAM.

#### 1.15.2 Whole Body Protection

Personnel exposed to airborne concentrations of asbestos that exceed the PELs, or for all OSHA Classes of work for which a required negative exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. The Contractor's Designated IH and Competent Person shall select and approve the whole body protection to be used. The Competent Person shall examine work suits worn by employees at least once per work shift for rips or tears that may occur during performance of work. When rips or tears are detected while an employee is working, rips and tears shall be immediately mended, or the work suit shall be immediately replaced. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from the regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from the regulated area or be properly laundered in accordance with 29 CFR 1926, Section .1101. Whole body protection used for asbestos abatement shall not be removed from the worksite by a worker to be cleaned. Recommendations made by the Contractor's Designated IH to downgrade whole body protection shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person, in consultation with the Designated IH, has the authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to the health and safety of the wearer.

##### 1.15.2.1 Coveralls

Disposable-impermeable or disposable-breathable coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles. See DETAIL SHEET 13.

##### 1.15.2.2 Underwear

Disposable underwear shall be provided. If reusable underwear is used, they shall be disposed of as asbestos contaminated waste or laundered in accordance with 29 CFR 1926, Section .1101. Asbestos abatement workers shall not remove contaminated reusable underwear worn during abatement of ACM from the site to be laundered.

##### 1.15.2.3 Work Clothing

An additional coverall shall be provided when the abatement and control method employed does not provide for the exit from the regulated area directly into an attached decontamination unit. Cloth work clothes for wear under the protective coverall, and foot coverings, shall be provided when work is being conducted in low temperature conditions. Cloth work clothes shall be either disposed of as asbestos contaminated waste or properly laundered in accordance with 29 CFR 1926, Section .1101.

##### 1.15.2.4 Gloves

Gloves shall be provided to protect the hands. Where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.) a suitable glove shall be provided and used.

#### 1.15.2.5 Foot Coverings

Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and EM 385-1-1, that is appropriate for safety and health hazards in the area shall be worn. Rubber boots shall be used in moist or wet areas. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as ACM waste. Disposable protective foot covering shall be disposed of as ACM waste. If rubber boots are not used, disposable foot covering shall be provided.

#### 1.15.2.6 Head Covering

Hood type disposable head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

#### 1.15.2.7 Protective Eye Wear

Eye protection provided shall be in accordance with ANSI Z87.1.

### 1.16 HYGIENE FACILITIES AND PRACTICES

The Contractor shall establish a decontamination area for the decontamination of employees, material and equipment. The Contractor shall ensure that employees enter and exit the regulated area through the decontamination area.

#### 1.16.1 Shower Facilities

Shower facilities, when provided, shall comply with 29 CFR 1910, Section .141(d)(3).

#### 1.16.2 3-Stage Decontamination Area

A temporary negative pressure decontamination unit that is adjacent and attached in a leak-tight manner to the regulated area shall be provided as described in SET-UP DETAIL SHEET Numbers 22 and 23. Utilization of prefabricated units shall not be used. The decontamination unit shall have an equipment room and a clean room separated by a shower that complies with 29 CFR 1910, Section .141. Equipment and surfaces of containers filled with ACM shall be cleaned prior to removing them from the equipment room or area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste. Two separate lockers shall be provided for each asbestos worker, one in the equipment room and one in the clean room. Should sufficient hot water be unavailable, the Contractor shall provide a minimum 160 L electric water heater with minimum recovery rate of 80 L per hour and a temperature controller for each showerhead. The Contractor shall provide a minimum of 1 shower. Instantaneous type, in-line, water heater may be incorporated at each shower head in lieu of hot water heater, upon approval by the Contracting Officer. Flow and temperature controls shall be located within the shower and shall be adjustable by the user. The wastewater pump shall be sized for 1.25 times the showerhead flow-rate at a pressure head sufficient to satisfy the filter head loss and discharge line losses. The pump shall supply a minimum 1.6 L/s flow with 10.7 m of pressure head. Used shower water shall be collected and filtered to remove asbestos contamination. Filters and residue shall be disposed of as

asbestos contaminated material, per DETAIL SHEETS 9 and 14. Filtered water shall be discharged to the sanitary system. Wastewater shall not be disposed of in open canals or drainage ditches. Wastewater filters shall be installed in series with the first stage pore size of 20 microns and the second stage pore size of 5 microns. The floor of the decontamination unit's clean room shall be kept dry and clean at all times. Water from the shower shall not be allowed to wet the floor in the clean room. Surfaces of the clean room and shower shall be wet-wiped 2 times after each shift change with a disinfectant solution. Proper housekeeping and hygiene requirements shall be maintained. Soap and towels shall be provided for showering, washing and drying. Any cloth towels provided shall be disposed of as ACM waste or shall be laundered in accordance with 29 CFR 1926, Section .1101.

#### 1.16.3 Load-Out Unit

A temporary load-out unit that is adjacent and connected to the regulated area shall be provided as described in DETAIL SHEET Number 20. Utilization of prefabricated units shall have prior approval of the Contracting Officer. The load-out unit shall be attached in a leak-tight manner to each regulated area. Surfaces of the load-out unit and access tunnel shall be adequately wet-wiped 2 times after each shift change. Materials used for wet wiping shall be disposed of as asbestos contaminated waste.

#### 1.16.4 Single Stage Decontamination Area

A decontamination area (equipment room/area) shall be provided for Class I work involving less than 7.5 m or 0.9 square meters of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment produced before the operation. The equipment room or area shall be adjacent to the regulated area for the decontamination of employees, material, and their equipment which is contaminated with asbestos. The equipment room or area shall consist of an area covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste.

#### 1.16.5 Decontamination Requirements for Class IV Work

The Contractor shall ensure that employees performing Class IV work within a regulated area comply with the hygiene practice required of employees performing work which has a higher classification within that regulated area, or the Contractor shall provide alternate decontamination area facilities for employees cleaning up debris and material which is TSI or surfacing ACM.

#### 1.16.6 Decontamination Area Entry Procedures

The Contractor shall ensure that employees entering the decontamination area through the clean room or clean area:

- a. Remove street clothing in the clean room or clean area and deposit it in lockers.
- b. Put on protective clothing and respiratory protection before

leaving the clean room or clean area.

- c. Pass through the equipment room to enter the regulated area.

#### 1.16.7 Decontamination Area Exit Procedures

The Contractor shall ensure that the following procedures are followed:

- a. Before leaving the regulated area, respirators shall be worn while employees remove all gross contamination and debris from their work clothing using a HEPA vacuum.
- b. Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers (see Detail Sheets 9 and 14) for disposal and/or laundering.
- c. Employees shall not remove their respirators in the equipment room.
- d. Employees shall shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, the Contractor shall ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.
- e. After showering, employees shall enter the clean room before changing into street clothes.

#### 1.16.8 Lunch Areas

The Contractor shall provide lunch areas in which the airborne concentrations of asbestos are below 0.01 f/cc.

#### 1.16.9 Smoking

Smoking, if allowed by the Contractor, shall only be permitted in designated areas approved by the Contracting Officer.

#### 1.17 REGULATED AREAS

All Class I, II, and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they shall demarcate the regulated area. Access to regulated areas shall be limited to authorized persons. The Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

#### 1.18 WARNING SIGNS AND TAPE

Warning signs and tape printed in English and in pictographs and graphics

shall be provided at the regulated boundaries and entrances to regulated areas. The Contractor shall ensure that all personnel working in areas contiguous to regulated areas comprehend the warning signs. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area. Warning signs, as shown and described in DETAIL SHEET 11, shall be in vertical format conforming to 29 CFR 1910 and 29 CFR 1926, Section .1101, a minimum of 500 by 350 mm, and displaying the following legend in the lower panel:

DANGER  
ASBESTOS  
CANCER AND LUNG DISEASE HAZARD  
AUTHORIZED PERSONNEL ONLY

"Respirators and Protective Clothing Are Required In this Area" will be added to the warning sign when protective equipment is required. Spacing between lines shall be at least equal to the height of the upper of any two lines. Warning tape shall be provided as shown and described on DETAIL SHEET 11. Decontamination unit signage shall be as shown and described on DETAIL SHEET 15.

#### 1.19 WARNING LABELS

Warning labels shall be affixed to all asbestos disposal containers used to contain asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable. Warning labels shall be as described in DETAIL SHEET 14, shall conform to 29 CFR 1926, Section .1101 and shall be of sufficient size to be clearly legible displaying the following legend:

DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD

#### 1.20 LOCAL EXHAUST VENTILATION

Local exhaust ventilation units shall conform to ANSI Z9.2 and 29 CFR 1926, Section .1101. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

#### 1.21 TOOLS

Vacuums shall be leakproof to the filter, equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system, or has otherwise been approved for use by the Contracting Officer. Residual asbestos shall be removed from reusable tools prior to storage and reuse. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

#### 1.22 RENTAL EQUIPMENT

If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of the equipment and the steps that



will be taken to decontaminate such equipment. A written acceptance of the terms of the Contractor's notification shall be obtained from the rental agency.

#### 1.23 AIR MONITORING EQUIPMENT

The Contractor's Designated IH shall approve air monitoring equipment to be used to collect samples. The equipment shall include, but shall not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute when equipped with a sampling train of tubing and filter cassette.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute when equipped with a sampling train of tubing and filter cassette, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps shall also be equipped with an automatic flow control unit which shall maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands, to be used with low flow pumps in accordance with 29 CFR 1926, Section .1101 for personal air sampling.
- d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands, to be used with high flow pumps when conducting environmental area sampling using NIOSH Pub No. 84-100 Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).
- e. Appropriate plastic tubing to connect the air sampling pump to the selected filter cassette.
- f. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 20 to plus 60 degrees C and traceable to a NIST primary standard.

#### 1.24 EXPENDABLE SUPPLIES

##### 1.24.1 Glovebag

Glovebags shall be provided as described in 29 CFR 1926, Section .1101 and SET-UP DETAIL SHEET 10. The glovebag assembly shall be 0.15 mm thick plastic, prefabricated and seamless at the bottom, with preprinted OSHA and DOT warning labels.

##### 1.24.2 Duct Tape

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container shall be provided.

#### 1.24.3 Disposal Containers

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926 Section .1101 and DETAIL SHEETS 9A, 9B, 9C and 14.

#### 1.24.4 Disposal Bags

Leak-tight bags, 0.15 mm thick, shall be provided for placement of asbestos generated waste as described in DETAIL SHEET 9A.

#### 1.24.5 Fiberboard Drums

Fiberboard drums shall be utilized whenever bagged waste materials are transported outside of containment and through the work area to a separately located truck or holding area on the site. Drums may be re-used as long as no breaks in the bags or other contamination has occurred.

#### 1.24.6 Cardboard Boxes

Heavy-duty corrugated cardboard boxes, coated with plastic or wax to retard deterioration from moisture, shall be provided as described in DETAIL SHEET 9C, if fiberboard drums are not used. Filled boxes shall be sealed leak-tight with duct tape and contain appropriate labels.

#### 1.24.7 Sheet Plastic

Sheet plastic shall be polyethylene of 0.15 mm minimum thickness and shall be provided in the largest sheet size necessary to minimize seams. Film shall be clear or frosted and for decon showers, and conform to ASTM D 4397, except as specified below:

##### 1.24.7.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets shall be provided. Film shall be [frosted] [or] [black] and shall conform to the requirements of NFPA 701.

##### 1.24.7.2 Reinforced

Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

#### 1.24.8 Amended Water

Amended water shall meet the requirements of ASTM D 1331.

#### 1.24.9 Mastic Removing Solvent

Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 60 degrees C.

#### 1.24.10 Leak-tight Wrapping

Two layers of 0.15 mm minimum thick polyethylene sheet stock shall be used

for the containment of removed asbestos-containing components or materials such as reactor vessels, large tanks, boilers, insulated pipe segments and other materials too large to be placed in disposal bags as described in DETAIL SHEET 9B. Upon placement of the ACM component or material, each layer shall be individually leak-tight sealed with duct tape.

#### 1.24.11 Viewing Inspection Window

Where feasible, a minimum of 1 clear, 3 mm thick, acrylic sheet, 450 by 610 mm, shall be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows shall be sealed leak-tight with industrial grade duct tape.

#### 1.24.12 Wetting Agents

Removal encapsulant (a penetrating encapsulant) shall be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant shall be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS.

#### 1.25 MISCELLANEOUS ITEMS

A sufficient quantity of other items, such as, but not limited to: scrapers, brushes, brooms, staple guns, tarpaulins, shovels, rubber squeegees, dust pans, other tools, scaffolding, staging, enclosed chutes, wooden ladders, lumber necessary for the construction of containment units, UL approved temporary electrical equipment, material and cords, ground fault circuit interrupters, water hoses of sufficient length, fire extinguishers, first aid kits, portable toilets, logbooks, log forms, markers with indelible ink, spray paint in bright color to mark areas, project boundary fencing, etc., shall be provided.

### PART 2 PRODUCTS

#### 2.1 ENCAPSULANTS

Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent and shall meet the following requirements:

##### ALL ENCAPSULANTS

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E 84
Combustion Toxicity Zero Mortality	Univ. of Pittsburgh Protocol
Life Expectancy, 20 yrs Accelerated Aging Test	ASTM C 732
Permeability, Min. 23 ng per Pa-sec-square m	ASTM E 96

##### Additional Requirements for Bridging Encapsulant

Requirement	Test Standard
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## ALL ENCAPSULANTS

Requirement	Test Standard
Cohesion/Adhesion Test, 730 N/m	ASTM E 736
Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E 119
Impact Resistance, Min. 4.7 N-m (Gardner Impact Test)	ASTM D 2794
Flexibility, no rupture or cracking (Mandrel Bend Test)	ASTM D 522

## Additional Requirements for Penetrating Encapsulant

Requirement	Test Standard
Cohesion/Adhesion Test, 730 N/m	ASTM E 736
Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E 119
Impact Resistance, Min. 4.7 N-m (Gardner Impact Test)	ASTM D 2794
Flexibility, no rupture or cracking (Mandrel Bend Test)	ASTM D 522

## Additional Requirements for Lockdown Encapsulant

Requirement	Test Standard
Fire Resistance, Negligible affect on fire resistance rating over 3 hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E 119
Bond Strength, 1.5 kN/m (Tests compatibility with cementitious and fibrous fireproofing)	ASTM E 736

## PART 3 EXECUTION

## 3.1 GENERAL REQUIREMENTS

Asbestos abatement work tasks shall be performed as shown on the detailed plans and drawings located in the survey report, as summarized in paragraph DESCRIPTION OF WORK and including Table 1 and the Contractor's Accident Prevention Plan, Asbestos Hazard Abatement Plan, and the Activity Hazard Analyses. The Contractor shall use the engineering controls and work practices required in 29 CFR 1926, Section .1101(g) in all operations regardless of the levels of exposure. Personnel shall wear and utilize

protective clothing and equipment as specified. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area. All hot work (burning, cutting, welding, etc.) shall be conducted under controlled conditions in conformance with 29 CFR 1926, Section .352, Fire Prevention. Personnel of other trades, not engaged in asbestos abatement activities, shall not be exposed at any time to airborne concentrations of asbestos unless all the administrative and personal protective provisions of the Contractor's Accident Prevention Plan are complied with. Power to the regulated area shall be locked-out and tagged in accordance with 29 CFR 1910, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. The Contractor shall stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. The Contractor shall correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work shall resume only upon notification by the Contracting Officer. Corrective actions shall be documented.

### 3.2 PROTECTION OF ADJACENT WORK OR AREAS TO REMAIN

Asbestos abatement shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government, as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, work shall stop in all effected areas immediately and the spill shall be cleaned. When satisfactory visual inspection and air sampling analysis results are obtained and have been evaluated by the Contractor's Designated IH and the Contracting Officer, work shall proceed.

### 3.3 OBJECTS

#### 3.3.1 Removal of Mobile Objects

Mobile objects, furniture, and equipment will be removed from the area of work by the Government before asbestos abatement work begins. Carpets, draperies, and other items not removed prior to abatement proceedings and which may be contaminated shall be brought to the attention of the Contracting officer prior to commencement of abatement work. These materials may be designated by the Contracting Officer, to be removed as asbestos contaminated materials.

#### 3.3.2 Stationary Objects

Stationary objects and furnishings shall be covered with 2 layers of polyethylene and edges sealed with duct tape.

#### 3.3.3 Reinstallation of Mobile Objects

No mobile objects are to be returned to the buildings as the buildings are scheduled for demolition.

### 3.4 BUILDING VENTILATION SYSTEM AND CRITICAL BARRIERS

Building ventilating systems supplying air into or returning air out of a regulated area shall be shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910, Section .147. and isolated by airtight seals to prevent the spread of contamination throughout the system. Air-tight critical barriers shall be installed on building ventilating openings located inside the regulated area that supply or return air from the building ventilation system or serve to exhaust air from the building. The critical barriers shall consist of 2 layers of polyethylene. Edges to wall, ceiling and floor surfaces shall be sealed with industrial grade duct tape. Critical barriers shall be installed as shown on drawings and appended SET-UP DETAIL SHEETS.

### 3.5 PRECLEANING

Surfaces shall be cleaned by HEPA vacuum prior to establishment of containment

### 3.6 METHODS OF COMPLIANCE

#### 3.6.1 Mandated Practices

The Contractor shall employ proper handling procedures in accordance with 29 CFR 1926 and 40 CFR 61, Subpart M, and the specified requirements. The specific abatement techniques and items identified shall be detailed in the Contractor's Asbestos Hazard Abatement Plan including, but not limited to, details of construction materials, equipment, and handling procedures. The Contractor shall use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters to collect debris and dust containing ACM.
- b. Wet methods or wetting agents to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup; except where it can be demonstrated that the use of wet methods is unfeasible due to, for example, the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal in leak-tight containers of wastes and debris contaminated with asbestos.
- d. Inspection and repair of polyethylene in work and high traffic areas.
- e. Cleaning of equipment and surfaces of containers filled with ACM prior to removing them from the equipment room or area.

#### 3.6.2 Control Methods

The Contractor shall use the following control methods to comply with the PELs:

- a. Local exhaust ventilation equipped with HEPA filter dust collection systems;
- b. Enclosure or isolation of processes producing asbestos dust;
- c. Ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or

collection device equipped with a HEPA filter;

- d. Use of other work practices and engineering controls;
- e. Where the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the PELs, the Contractor shall use them to reduce employee exposure to the lowest levels attainable by these controls and shall supplement them by the use of respiratory protection that complies with paragraph, RESPIRATORY PROTECTION PROGRAM.

### 3.6.3 Unacceptable Practices

The following work practices and engineering controls shall not be used for work related to asbestos or for work which disturbs ACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- c. Dry sweeping, shoveling, or other dry clean-up of dust and debris containing ACM.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

### 3.6.4 Class I Work Procedures

OSHA believes that most outdoor Class I work may be safely done without enclosures (ref. OSHA Instruction CPL 2-2.63, change 1, dated 9 January 1996); that is, OSHA does not require enclosures. An exposure assessment must be made prior to outdoor work to determine other required controls.

In addition to requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the installation and operation of the control system.
- b. For jobs involving the removal of more than 7.5 m or 0.9 square meters of TSI or surfacing material, the Contractor shall place critical barriers over all openings to the regulated area.
- c. HVAC systems shall be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.
- d. Impermeable drop cloths (0.15 mm or greater thickness) shall be placed on surfaces beneath all removal activity.
- e. Objects within the regulated area shall be handled as specified in paragraph OBJECTS.

- f. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area shall be ventilated to move contaminated air away from the employee's breathing zone toward a HEPA unit or collection device.

### 3.6.5 Specific Control Methods for Class I Work

In addition to requirements of paragraph Class I Work Procedures, Class I asbestos work shall be performed using the control methods identified in the subparagraphs below.

#### 3.6.5.1 Negative Pressure Enclosure (NPE) System

Because ACM floor tile is present in as high as three layers of floor tile, heating and chemical removal methods will not be feasible. Georgia Abatement regulations requires that all ACM floor tile that is mechanically removed must be treated as removal of friable materials. Containment will be required for floor tile removal. The containment system shall provide at least 4 air changes per hour inside the containment. The local exhaust unit equipment shall be operated 24 hours per day until the containment is removed, and shall be leak-proof to the filter and equipped with HEPA filters. Air movement shall be directed away from the employees and toward a HEPA filtration device. The NPE shall be smoke tested for leaks at the beginning of each shift. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.5 mm of water column relative to adjacent, unsealed areas. Pressure differential shall be monitored continuously, 24 hours per day, with an automatic manometric recording instrument. Pressure differential recordings shall be provided daily on the same day collected. Readings shall be reviewed by the Contractor's Designated Competent Person and IH prior to submittal. The Contracting Officer shall be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system shall not be used as the local exhaust system for the regulated area. The local exhaust system shall terminate outdoors unless an alternate arrangement is allowed by the Contract Officer. All filters used shall be new at the beginning of the project and shall be periodically changed as necessary and disposed of as ACM waste.

#### 3.6.5.2 Glovebag Systems

Glovebag systems shall be as shown in SETUP DETAIL SHEET 10. The glovebag system shall be used to remove ACM from straight runs of piping and elbows and other connections. Glovebags shall be used without modification and shall be smoke-tested for leaks and any leaks sealed prior to use. Glovebags shall be installed to completely cover the circumference of pipe or other structures where the work is to be done. Glovebags shall be used only once and shall not be moved. Glovebags shall not be used on surfaces that have temperatures exceeding 66 degrees C. Prior to disposal, glovebags shall be collapsed by removing air within them using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation shall be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least 2 persons shall perform Class I glovebag removal. Asbestos regulated work areas shall be established as specified and shown on detailed drawings and plans for glovebag abatement. Designated boundary limits for the asbestos work shall be established with rope or other continuous barriers and all other requirements for asbestos control areas shall be maintained, including area



signage and boundary warning tape as specified in SET-UP DETAIL SHEET 11.

- a. In addition to requirements for negative pressure glovebag systems above, the Contractor shall attach HEPA vacuum systems or other devices to the bag to prevent collapse during removal of ACM from straight runs of piping and elbows and other connections.
- b. The negative pressure glove boxes used to remove ACM from pipe runs shall be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure shall be created in the system using a HEPA filtration system. The box shall be smoke tested for leaks prior to each use.

#### 3.6.5.3 Mini-Enclosures

Single bulkhead containment or mini-containment (small walk-in enclosure) as shown in SETUP DETAIL SHEET 5 and 7 to accommodate no more than 2 persons, may be used if the disturbance or removal can be completely contained by the enclosure with the following specifications and work practices. The mini-enclosure shall be inspected for leaks and smoke tested before each use. Air movement shall be directed away from the employee's breathing zone within the mini-enclosure.

#### 3.6.5.4 Wrap and Cut Operation

Wrap and cut operations shall be as shown in SETUP DETAIL SHEET 9B and 10. Prior to cutting pipe, the asbestos-containing insulation shall be wrapped with polyethylene and securely sealed with duct tape to prevent asbestos becoming airborne as a result of the cutting process. The following steps shall be taken: install glovebag, strip back sections to be cut 150 mm from point of cut, and cut pipe into manageable sections.

#### 3.6.6 Class II Work

In addition to the requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

- a. A Competent Person shall supervise the work.
- b. For indoor work, critical barriers shall be placed over all openings to the regulated area.
- c. Impermeable dropcloths shall be placed on surfaces beneath all removal activity.

#### 3.6.7 Specific Control Methods for Class II Work

In addition to requirements of paragraph Class II Work, Class II work shall be performed using the following methods:

##### 3.6.7.1 Vinyl and Asphalt Flooring Materials

When removing vinyl and asphalt flooring materials which contain or is assumed to contain asbestos the Contractor will remove as a friable material when employing any mechanical means of removal. Resilient sheeting shall be removed by adequately wet methods. Tiles shall be

removed intact (if possible); wetting is not required when tiles are heated and removed intact. Flooring or its backing shall not be sanded. Scraping of residual adhesive and/or backing shall not be performed as the material is considered non-friable and can be demolished with the building. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. The Contractor shall use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors.

#### 3.6.7.2 Roofing Material

When removing roofing materials which contain ACM as described in 29 CFR 1926, Section .1101(g)(8)(ii), the Contractor shall use the following practices. Roofing material shall be removed in an intact state. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards. When removing built-up roofs, with asbestos-containing roofing felts and an aggregate surface, using a power roof cutter, all dust resulting from the cutting operations shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line. Asbestos-containing roofing material shall not be dropped or thrown to the ground, but shall be lowered to the ground via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. Any ACM that is not intact shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. While the material remains on the roof it shall be kept wet or placed in an impermeable waste bag or wrapped in plastic sheeting. Intact ACM shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. Unwrapped material shall be transferred to a closed receptacle precluding the dispersion of dust. Critical barriers shall be placed over roof level heating and ventilation air intakes.

#### 3.6.7.3 Cementitious Siding and Shingles or Transite Panels

Intentionally cutting, abrading or breaking siding, shingles, or transite panels is prohibited. Each panel or shingle shall be sprayed with amended water prior to removal. Nails shall be cut with flat, sharp instruments. Unwrapped or unbagged panels or shingles shall be immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift.

#### 3.6.7.4 Gaskets

Gaskets shall be thoroughly wetted with amended water prior to removal and immediately placed in a disposal container. If a gasket is visibly deteriorated and unlikely to be removed intact, removal shall be undertaken within a glovebag. Any scraping to remove residue shall be performed wet.

#### 3.6.7.5 Other Class II Jobs

The Contractor shall use the following work practices when performing Class II removal of previously unidentified ACM: The material shall be thoroughly wetted with amended water prior and during its removal. The material shall be removed in an intact state. Cutting, abrading or breaking the material is prohibited. The ACM removed shall be immediately bagged or wrapped.

#### 3.6.8 Specific Control Methods for Class III Work

There is no anticipated Class III ACM repairs for this project.

#### 3.6.9 Specific Control Methods for Class IV Work

Class IV jobs shall be conducted using wet methods, HEPA vacuums, and prompt clean-up of debris containing ACM. Employees cleaning up debris and waste in a regulated area where respirators are required shall wear the selected respirators.

#### 3.6.10 Alternative Methods for Roofing Materials and Asphaltic Wrap

The Contractor shall use the following engineering controls and work practices when removing intact pipeline asphaltic wrap, or roof cements, mastics, coatings, or flashings which contain asbestos fibers encapsulated or coated by bituminous or resinous compounds. If during the course of the job the material does not remain intact, the Contractor shall use the procedures described in paragraph Roofing Material. Before work begins, and as needed during the job, the Designated Competent Person shall conduct an inspection and determine that the roofing material is intact and will likely remain intact. The material shall not be sanded, abraded, or ground. Manual methods which would render the material non-intact shall not be used. Roofing material shall not be dropped or thrown to the ground but shall be lowered via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. All such material shall be removed from the roof as soon as practicable, but not later than the end of the work shift. Removal or disturbance of pipeline asphaltic wrap shall be performed using wet methods.

#### 3.6.11 Cleaning After Asbestos Removal

After completion of all asbestos removal work, surfaces from which ACM has been removed shall be wet wiped or sponged clean, or cleaned by some equivalent method to remove all visible residue. Run-off water shall be collected and filtered through a dual filtration system. A first filter shall be provided to remove fibers 20 micrometers and larger, and a final filter provided that removes fibers 5 micrometers and larger. After the gross amounts of asbestos have been removed from every surface, remaining visible accumulations of asbestos on floors shall be collected using plastic shovels, rubber squeegees, rubber dustpans, and HEPA vacuum cleaners as appropriate to maintain the integrity of the regulated area. When TSI and surfacing material has been removed, workmen shall use HEPA vacuum cleaners to vacuum every surface. Surfaces or locations which could harbor accumulations or residual asbestos dust shall be checked after vacuuming to verify that no asbestos-containing material remains; and shall be re-vacuumed as necessary to remove the ACM.

#### 3.6.12 Class I Asbestos Work Response Action Detail Sheets

Keep in mind that removal method for ACM floor tile determines, under State of Georgia Asbestos Regulations, whether it is considered Category I or Category II. Methods depicted on detail sheets may not reflect this point. It is the Contractor's responsibility to meet Georgia Regulations.

The following Class I Asbestos Work is specified on Table 1 for some of the individual work task to be performed:

- a. Asbestos Fireproofing or Thermal Surface Insulation: See Sheet 68

- b. Pipe and Fitting Insulation (using Glovebag): See Sheet 86
- c. Duct Insulation: Duct work insulation removal shall not begin without the written authorization of the Contracting Officer stating that the HVAC system to be worked on is either isolated or inoperative and locked out of service. Forced air circulation is not permitted in ductwork while abatement work is in progress. See Sheet 101
- d. Pipe Insulation (Using a Glovebag): See Sheet 87
- e. Horizontal Pipe Insulation (Using a Containment Area): See Sheet 88
- f. Pipe Insulation (Using a Mini-Containment Area): See Sheet 89

### 3.6.13 Class II Asbestos Work Response Action Detail Sheets

The following Class II Asbestos Work Response Action Detail Sheet is specified for each individual work task to be performed. These are included based upon the information made available in the survey report. In areas that are vague, all similar detail sheets have been included. Some of these may not be applicable:

- a. Suspended Asbestos Cement Ceiling Tile: See Sheet 52
- b. Asbestos Cement Architectural Products: See Sheet 53
- c. Glued-on Acoustical Ceiling and Wall Tile: See Sheet 55
- d. Suspended Acoustical Ceiling Tile: See Sheet 54
- e. Vinyl or Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos-Containing Adhesive: See Sheet 56
- f. Vinyl or Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Containing Adhesive: See Sheet 60
- g. Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos Containing Adhesive: See Sheet 57
- h. Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos Free Adhesive: See Sheet 58
- i. Vinyl Asbestos Tile and Chemical Dissolution of Asbestos-Containing Adhesives on Concrete Floor System: See Sheet 59
- j. Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos-Containing Adhesive: See Sheet 61
- k. Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Free Adhesive: See Sheet 62
- l. Sheet Flooring Adhered Wood Floor System: See Sheet 63
- m. Asbestos-Containing Sheet Flooring Adhered to Concrete Floor System by Asbestos-Containing Adhesive: See Sheet 64

- n. Miscellaneous Asbestos-Containing Materials: See Sheet 45
- o. Built-Up Roofing and Flashing: See Sheet 74
- p. Roof, Shingles and Underlayment: See Sheet 75
- q. Asbestos Cement Siding: See Sheet 81

### 3.6.14 Abatement of Asbestos Contaminated Soil

Asbestos contaminated soil is not expected on this project due to the relatively non-friable nature of most of the ACM. Should soil be inadvertently be contaminated, clean-up will follow the following protocol.

Soil shall be removed from areas to a minimum depth of 50 mm. or Soil shall be thoroughly dampened with amended water and then removed by manual shoveling into labeled containers. The workers shall be closely monitored for heat exhaustion. The minimum ventilation shall be 8 air changes per hour through a local exhaust HEPA system

### 3.7 FINAL CLEANING AND VISUAL INSPECTION

Upon completion of abatement, the regulated area shall be cleaned by collecting, packing, and storing all gross contamination; see SET-UP DETAIL SHEETS 9, 14 and 20. A final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area.

Upon completion of the cleaning, the Contractor shall conduct a visual pre-inspection of the cleaned area in preparation for a final inspection before final air clearance monitoring and recleaning, as necessary. Upon completion of the final cleaning, the Contractor and the Contracting Officer shall conduct a final visual inspection of the cleaned regulated area in accordance with ASTM E 1368 and document the results on the Final Cleaning and Visual Inspection as specified on the SET-UP DETAIL SHEET 19. If the Contracting Officer rejects the clean regulated area as not meeting final cleaning requirements, the Contractor shall reclean as necessary and have a follow-on inspection conducted with the Contracting Officer. Recleaning and follow-up reinspection shall be at the Contractor's expense.

### 3.8 LOCKDOWN

Prior to removal of plastic barriers and after clean-up of gross contamination and final visual inspection, a post removal (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces in the regulated area.

### 3.9 EXPOSURE ASSESSMENT AND AIR MONITORING

#### 3.9.1 General Requirements For Exposure

Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926, Section .1101, the Contractor's air monitoring plan, and as specified. Personal exposure air monitoring (collected at the breathing zone) that is representative of the exposure of each employee who is assigned to work within a regulated area shall be performed by the Contractor's Designated IH. Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level shall be calculated as shown in Table 2 at the end of this section. The Contractor shall provide an onsite independent testing laboratory with qualified analysts

and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926, Section .1101, to include NIOSH Pub No. 84-100 Method 7400. Preabatement and abatement environmental air monitoring shall be performed by the Contractor's Designated IH. Oversight sampling (QA) may be conducted by the Contracting Officer's IH. Final clearance environmental air monitoring, shall be performed by the Contractor's Designated IH. Environmental and final clearance air monitoring shall be performed using NIOSH Pub No. 84-100 Method 7400 (PCM) with optional confirmation of results by NIOSH Pub No. 84-100 Method 7402 (TEM). For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at 0.005 f/cc. Confirmation of asbestos fiber concentrations (asbestos f/cc) from environmental and final clearance samples collected and analyzed by NIOSH Pub No. 84-100 Method 7400 (total f/cc) may be conducted using TEM in accordance with NIOSH Pub No. 84-100 Method 7402. When such confirmation is conducted, it shall be from the same sample filter used for the NIOSH Pub No. 84-100 Method 7400 PCM analysis. For all Contractor required environmental or final clearance air monitoring, confirmation of asbestos fiber concentrations, using NIOSH Pub No. 84-100 Method 7402, shall be at the Contractor's expense. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. Results of breathing zone samples shall be posted at the job site and made available to the Contracting Officer. The Contractor shall maintain a fiber concentration inside a regulated area less than or equal to 0.1 f/cc expressed as an 8 hour, time-weighted average (TWA) during the conduct of the asbestos abatement. If fiber concentration rises above 0.1 f/cc, work procedures shall be investigated with the Contracting Officer to determine the cause. At the discretion of the Contracting Officer, fiber concentration may exceed 0.1 f/cc but shall not exceed 1.0 f/cc expressed as an 8-hour TWA. The Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should either an environmental concentration of 1.0 f/cc expressed as an 8-hour TWA or a personal excursion concentration of 1.0 f/cc expressed as a 30-minute sample occur inside a regulated work area, the Contractor shall stop work immediately, notify the Contracting Officer, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Work shall not restart until authorized by the Contracting Officer.

### 3.9.2 Initial Exposure Assessment

The Contractor's Designated IH shall conduct an exposure assessment immediately before or at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. The assessment shall be completed in time to comply with the requirements which are triggered by exposure data or the lack of a negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation. The assessment shall take into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the Contractor which indicate the levels of airborne asbestos likely to be encountered on the job. For Class I asbestos work, until the employer conducts exposure monitoring and documents that employees on that job will not be exposed in excess of PELs, or otherwise makes a negative exposure assessment, the Contractor shall presume that employees are exposed in excess of the PEL-TWA and PEL-Excursion Limit.

### 3.9.3 Negative Exposure Assessment

The Contractor shall provide a negative exposure assessment for the specific asbestos job which will be performed. The negative exposure assessment shall be provided within 5 days of the initiation of the project and conform to the following criteria:

- a. Objective Data: Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the PEL-TWA and PEL-Excursion Limit under those work conditions having the greatest potential for releasing asbestos.
- b. Prior Asbestos Jobs: Where the Contractor has monitored prior asbestos jobs for the PEL and the PEL-Excursion Limit within 12 months of the current job, the monitoring and analysis were performed in compliance with asbestos standard in effect; the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations; the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job; and these data show that under the conditions prevailing and which will prevail in the current workplace, there is a high degree of certainty that the monitoring covered exposure from employee exposures will not exceed the PEL-TWA and PEL-Excursion Limit.
- c. Initial Exposure Monitoring: The results of initial exposure monitoring of the current job, made from breathing zone air samples that are representative of the 8-hour PEL-TWA and 30-minute short-term exposures of each employee. The monitoring covered exposure from operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

### 3.9.4 Preabatement Environmental Air Monitoring

Preabatement environmental air monitoring shall be established 2 days prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, preabatement air samples shall be collected using NIOSH Pub No. 84-100 Method 7400, PCM at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 185 square meters of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the HEPA unit; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc, asbestos fiber concentration shall be confirmed using NIOSH Pub No. 84-100 Method 7402 (TEM).

### 3.9.5 Environmental Air Monitoring During Abatement

Until an exposure assessment is provided to the Contracting Officer, environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The assessment shall demonstrate that the

product or material containing asbestos minerals, or the abatement involving such product or material, cannot release airborne asbestos fibers in concentrations exceeding 0.01 f/cc as a TWA under those work conditions having the greatest potential for releasing asbestos. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; preabatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment (if used). If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01 f/cc, whichever is greater, work shall be stopped immediately, and the Contracting Officer notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Contracting Officer.

### 3.9.6 Final Clearance Air Monitoring

Prior to conducting final clearance air monitoring, the Contractor and the Contracting Officer shall conduct a final visual inspection of the regulated area where asbestos abatement has been completed. The final visual inspection shall be as specified in SET-UP DETAIL SHEET 19. Final clearance air monitoring shall not begin until acceptance of the Contractor's final cleaning by the Contracting Officer. The Contractor's Designated IH shall conduct final clearance air monitoring using aggressive air sampling techniques as defined in EPA 560/5-85-024 or as otherwise required by Federal or State requirements. The sampling and analytical method used will be NIOSH Pub No. 84-100 Method 7400 (PCM) and Table 3

#### 3.9.6.1 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH Pub No. 84-100 Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, shall be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) shall be confirmed from that same filter using NIOSH Pub No. 84-100 Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

#### 3.9.6.2 Final Clearance Requirements, EPA TEM Method

For EPA TEM sampling and analysis, using the EPA Method specified in 40 CFR 763, abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the 5 inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the 3 blank samples shall be analyzed. If the 3 blank samples are greater than 70 S/mm, re-sampling shall be done. If less than 70 S/mm, the 5 outside samples shall be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination shall be considered complete. If the Z-test results are more than 1.65, the abatement is incomplete and cleaning shall be repeated. Upon completion of any required re-cleaning, re-sampling with results to meet the above clearance criteria shall be done.

#### 3.9.6.3 Air Clearance Failure



If clearance sampling results fail to meet the final clearance requirements, the Contractor shall pay all costs associated with the required re-cleaning, re-sampling, and analysis, until final clearance requirements are met.

### 3.9.7 Air-Monitoring Results and Documentation

Air sample fiber counting shall be completed and results provided within 24 hours (breathing zone samples), and 24 hours (environmental/clearance monitoring) after completion of a sampling period. The Contracting Officer shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided to the Contracting Officer within 5 working days of the date of collection. The written results shall be signed by testing laboratory analyst, testing laboratory principal and the Contractor's Designated IH. It is recommended that the Contracting Officer submit copies of all air monitoring results to a Savannah District IH for review and analysis for regulatory acceptability. The air sampling results shall be documented on a Contractor's daily air monitoring log. The daily air monitoring log shall contain the following information for each sample in a table or spread-sheet format in addition to submitting actual copies of data required in (k):

- a. Sampling and analytical method used;
- b. Date sample collected;
- c. Sample number;
- d. Sample type: BZ = Breathing Zone (Personal), P = Preabatement, E = Environmental, C = Abatement Clearance;
- e. Location/activity/name where sample collected;
- f. Sampling pump manufacturer, model and serial number, beginning flow rate, end flow rate, average flow rate (L/min);
- g. Calibration date, time, method, location, name of calibrator, signature;
- h. Sample period (start time, stop time, elapsed time (minutes));
- i. Total air volume sampled (liters);
- j. Sample results (f/cc and S/mm square) if EPA methods are required for final clearance; correlation/extrapolation to OSHA PEL, STELS, and any other applicable exposure limits.
- k. Laboratory name, location, analytical method, analyst, confidence level. In addition, the printed name and a signature and date block for the Industrial Hygienist who conducted the sampling and for the Industrial Hygienist who reviewed the daily air monitoring log verifying the accuracy of the information.

### 3.10 CLEARANCE CERTIFICATION

When asbestos abatement is complete, ACM waste is removed from the regulated areas, and final clean-up is completed, the Contracting Officer

will certify the areas as safe before allowing the warning signs and boundary warning tape to be removed. After final clean-up and acceptable airborne concentrations are attained, but before the HEPA unit is turned off and the containment removed, the Contractor shall remove all pre-filters on the building HVAC system. No new pre-filters need be provided. The Contractor shall dispose of such filters as asbestos contaminated materials. The Contractor and the Contracting Officer shall visually inspect all surfaces within the containment for residual material or accumulated debris. The Contractor shall reclean all areas showing dust or residual materials. The Contracting Officer will certify in writing that the area is safe before unrestricted entry is permitted. The Government will have the option to perform monitoring to certify the areas are safe before entry is permitted.

### 3.11 CLEANUP AND DISPOSAL

#### 3.11.1 Title to ACM Materials

ACM material resulting from abatement work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified and in accordance with applicable , State and local regulations.

#### 3.11.2 Collection and Disposal of Asbestos

All ACM waste including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing, shall be collected and placed in leak-tight containers such as double plastic bags (see DETAIL SHEET 9A); sealed double wrapped polyethylene sheet (see DETAIL 9B); sealed fiberboard boxes (see DETAIL SHEET 9C); or other approved containers. Waste within the containers shall be wetted in case the container is breached. Asbestos-containing waste shall be disposed of at an EPA, state and local approved asbestos landfill. For temporary storage, sealed impermeable containers shall be stored in an asbestos waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in a manner acceptable to and in an area assigned by the Contracting Officer. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

#### 3.11.3 Scale Weight Measurement

Scales used for measurement shall be public scales. Weighing shall be at a point nearest the work at which a public scale is available. Scales shall be standard truck scales of the beam type; scales shall be equipped with the type registering beam and an "over and under" indicator; and shall be capable of accommodating the entire vehicle. Scales shall be tested, approved and sealed by an inspector of the State of Georgia. Scales shall be calibrated and resealed as often as necessary and at least once every 3 months to ensure continuous accuracy. Vehicles used for hauling ACM shall be weighed empty daily at such time as directed and each vehicle shall bear a plainly legible identification mark.

#### 3.11.4 Weigh Bill and Delivery Tickets

Copies of weigh bills and delivery tickets shall be submitted to the Contracting Officer during the progress of the work. The Contractor shall furnish the Contracting Officer scale tickets for each load of ACM weighed and certified. These tickets shall include tare weight; identification mark for each vehicle weighed; and date, time and location of loading and unloading. Tickets shall be furnished at the point and time individual

trucks arrive at the worksite. A master log of all vehicle loading shall be furnished for each day of loading operations. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified weigh bills and/or certified tickets and manifests of all ACM actually disposed by the Contractor for this contract.

#### 3.11.5 Asbestos Waste Shipment Record

The Contractor shall complete and provide the Contracting Officer final completed copies of the Waste Shipment Record for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to the landfill.

Each Waste Shipment Record shall be signed and dated by the Contractor, the waste transporter and disposal facility operator. No ACM shall be temporarily stored at an off-installation, transfer center for bulking purposes.

## Table 1 Notes

1. The following areas contain non-friable ACM that are to be removed prior to demolition. They are to be removed in a manner that does not render them friable. It is the responsibility of the Contractor to inform all subcontractors of the presence of ACM so that the materials may be handled appropriately. Nonfriable materials which are bound in a matrix do not become friable when pieces of that matrix (for example window caulk) are broken. For further clarification of removal of nonfriable ACM consult the State of Georgia Asbestos Regulations.

BLDG. # 1213 Exterior roof black sealant and window white caulk (260LF)  
Floor tile mastic (assumed pos.)

BLDG. #1214 Exterior black window caulk (96LF)  
BLDG. #1215 Exterior black and silver roof sealants (72LF)  
Floor tile mastic assumed pos.)

BLDG. #1216 Exterior window white caulk (assumed pos.)  
Floor tile mastic (assumed pos.)

BLDG. #1217 Exterior black roof mastic (50LF)  
Floor tile mastic (assumed pos.)

BLDG. #1218 Exterior black roof mastic (40LF)  
Floor tile mastic (assumed pos.)

BLDG. #1227 Floor tile mastic (assumed pos.)

BLDG. #1230 Exterior black roof sealer (40LF)  
Floor tile mastic (tested pos.)

BLDG. #1231 Window Caulk (463LF)  
Black roof sealant (30LF)  
Floor tile mastic (assumed pos.)

BLDG. #1235 Window Caulk (702LF)  
Black roof sealant (34LF)  
Floor tile mastic (assumed pos.)

BLDG. #1236 Window Grey Caulk (288LF)  
Black roof sealant (24LF)  
Floor tile mastic (assumed pos.)

BLDG. #1248 Window Caulk (463LF)  
Black roof sealant (40LF)  
Floor tile mastic (assumed pos.)

BLDG. #1251 Exterior black Caulk (20LF)  
Black roof sealant (64LF)  
Floor tile mastic (assumed pos.)

BLDG. #1259 Black roof sealant (32LF)  
Floor tile mastic (assumed pos.)

BLDG. #1260 Black roof sealant (30LF)

1. The Table 1 listed quantities of ACM to be removed are rounded up to provide quantity estimates. As the quantities are estimates, the Contractor needs to visit the site and determine the exact quantities to be removed. ACM vinyl tile quantities to be removed under this contract include all floor tile in closets, alcoves, service areas, under non-asbestos floor tile or carpet and in areas that would normally be unavailable to the survey/inspectors during normal occupancy of the buildings. Abatement of floor tile includes multiple layers of tile and all layers of mastic. 1 sq ft of sandwiched tile and mastic shall be removed without additional field cost modifications. The Contractor shall review the survey report and site conditions to determine which areas are multi-layered and bid accordingly. Building 223 floor tile was not tested by TEM as required by the Savannah District Military Design Manual. The Contractor shall take one sample for TEM analysis from each of the following areas:

Hallway east wing , 12x12 white VFT, and black VFT  
Storage Room east wing 12x12 white VFT

2. Work Task designation number is not a sequencing number. The Contractor shall determine the best sequence/order in which the materials are to be removed.

3. Not all roofing materials on Bldg. 223 were sampled for asbestos, only shingle and tar paper. The Contractor shall, at no additional cost, sample any suspected asbestos materials. Roofing material estimates in Table 1 Task 3, have been increased to assume that sealants are ACM. Should materials other than those listed in Table 1 be determined to be ACM then the Contractor shall submit this in writing to the COR for negotiation and appropriate reimbursement.

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet 1 of 10

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER 1
2. LOCATION OF WORK TASK Bldgs #1213, 1215, 1217, 1218, 1227, 1230, 1231, 1235, 1236, 1248, 1251, 1259, and 1260
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Asbestos floor tile in single, double or triple layers with asbestos containing floor mastics. Non-asbestos tile may cover some ACM layers. ACM tiles may date back to the 1940's when some of the buildings were built and may be in poor condition. Tile may be on wood or concrete substrate. Mastic is to be removed.
  - a. Type of Asbestos Chrysotile
  - b. Percent asbestos content 12- 13%, however some ACM floor tile has been assumed positive without confirmation by TEM.
4. ABATEMENT TECHNIQUE TO BE USED Mechanical
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class II.
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable X (See Ga Regs.)        Non-friable Category I         
Non-friable Category II
7. FORM tile        and CONDITION OF ACM: From GOOD X to FAIR X to POOR x
8. QUANTITY: METERS                                 , SQUARE METERS
- 8a. QUANTITY: LINEAR FT.                                 , SQUARE FT. 25,990

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet\_2\_\_\_\_ of \_\_\_\_10\_\_\_\_

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER \_\_\_\_2\_\_\_\_
2. LOCATION OF WORK TASK Bldgs. 1213, 1215, 1217, 1218, 1227, 1231, 1236, 1248, 1251, 1259, 1260
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Exterior Transite Material, in shingle, siding, composite sheeting, and panel materials
  - a. Type of Asbestos Chrysotile
  - b. Percent asbestos content up to 70%
4. ABATEMENT TECHNIQUE TO BE USED Cut fasteners, remove intact, wrap and dispose
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK NA
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable \_\_\_\_\_ Non-friable Category I X \_\_\_\_\_  
Non-friable Category II\_x \_\_\_\_\_
7. FORM cementious, Exterior and CONDITION OF ACM: GOOD x FAIR \_\_\_\_\_  
POOR \_\_\_\_\_
8. QUANTITY: METERS \_\_\_\_\_, SQUARE METERS \_\_\_\_\_
- 8a. QUANTITY: LINEAR FT. \_\_\_\_\_, SQUARE FT. 1,360

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet\_\_3\_\_ of \_\_10\_\_

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER 3\_\_\_\_\_
2. LOCATION OF WORK TASK Bldg. #s 1213, 1214, 1215, 1217, 1218, 1230, 1231, 1235, 1236, 1248 and 1251, 1259. 1260, 223 (assumed positive until tested)
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Black Roofing asbestos felt, roll tarred felt, asbestos silver and black mastic-like sealant \_\_\_\_
  - a. Type of Asbestos Chrysotile
  - b. Percent asbestos content 10%
4. ABATEMENT TECHNIQUE TO BE USED Removal
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class II
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable X\_\_\_\_\_ Non-friable Category I \_\_\_\_\_  
Non-friable Category II\_\_\_\_\_
7. FORM Exterior and CONDITION OF ACM: GOOD X \_\_\_\_ FAIR\_\_\_\_ POOR\_\_\_\_
8. QUANTITY: METERS\_\_\_\_\_, SQUARE METERS\_\_\_\_\_
- 8a. QUANTITY: LINEAR FT. 4,700 \_\_\_\_\_, SQUARE FT. 1,610



TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet\_4\_\_\_\_ of \_\_\_\_10\_\_\_\_

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER    \_4\_\_\_\_\_
2. LOCATION OF WORK TASK Bldg # 1215 (rm 116), 1218 (rm 105 &106), 1231 (rm 107), 1235 (rm 111) 223 (HVAC & Bathrooms east & west wing)
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Vibration joints
  - a. Type of Asbestos (Not available on all joints) Chrysotile
  - b. Percent asbestos content up to 90%
4. ABATEMENT TECHNIQUE TO BE USED Remove
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class II
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable YES\_\_\_\_\_ Non-friable Category I YES\_\_\_\_\_  
Non-friable Category II\_\_\_\_\_
7. FORM \_VARIES\_ and CONDITION OF ACM:   GOOD\_X \_\_\_\_ FAIR\_\_\_\_\_ POOR\_\_\_\_\_
8. QUANTITY:   METERS\_\_\_\_\_,   SQUARE METERS\_\_\_\_\_
- 8a. QUANTITY:   LINEAR FT.\_130 \_\_\_\_\_,   SQUARE FT.\_\_\_\_\_

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet 5 of 10

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER 5
2. LOCATION OF WORK TASK Bldg. 1229, Rm 111 & 114
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: sheet flooring
  - a. Type of Asbestos Chrysotile
  - b. Percent asbestos content 2%
4. ABATEMENT TECHNIQUE TO BE USED Removal
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK NA
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable \_\_\_\_\_ Non-friable Category I x  
Non-friable Category II \_\_\_\_\_
7. FORM Interior and CONDITION OF ACM: GOOD \_\_\_\_\_ FAIR x POOR \_\_\_\_\_
8. QUANTITY: METERS \_\_\_\_\_, SQUARE METERS \_\_\_\_\_
- 8a. QUANTITY: LINEAR FT. \_\_\_\_\_, SQUARE FT. 200 \_\_\_\_\_

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet\_\_6\_\_ of \_\_10\_\_

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER \_\_6\_\_
2. LOCATION OF WORK TASK Bldg.1229, rms 100-103, 107-110, 112, 113, 115, 117, H-100 & H101
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: ceramic tile grout, Assumed positive, not confirmed by TEM. Grout and tile is located underneath vinyl floor tile, some of which is confirmed ACM and some is not. See Survey Report.
  - a. Type of Asbestos No Data, Assumed Positive
  - b. Percent asbestos content No Data
4. ABATEMENT TECHNIQUE TO BE USED Remove
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK NA
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable \_\_\_\_\_ Non-friable Category I \_\_\_\_\_  
Non-friable Category II\_\_\_\_\_
7. FORM Interior and CONDITION OF ACM: GOOD\_\_X\_\_ FAIR\_\_\_\_\_ POOR\_\_\_\_\_
8. QUANTITY: METERS\_\_\_\_\_, SQUARE METERS\_\_\_\_\_
- 8a. QUANTITY: LINEAR FT.\_\_\_\_\_, SQUARE FT. 3,000\_\_\_\_\_

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet\_\_7\_\_ of \_\_10\_\_

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER \_\_7\_\_
2. LOCATION OF WORK TASK Bldg 1230
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Bldg 1230 TSI aircell,  
TSI fitted cloth wrap, TSI ATTIC INSULATED BOARD
  - a. Type of Asbestos Chrysotile
  - b. Percent asbestos content 30 -70%
4. ABATEMENT TECHNIQUE TO BE USED Removal
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class I
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable X\_\_\_\_ Non-friable Category I \_\_\_\_  
Non-friable Category II\_\_\_\_
7. FORM Interior\_ and CONDITION OF ACM: GOOD\_X FAIR\_\_\_\_ POOR\_X
8. QUANTITY: METERS\_\_\_\_, SQUARE METERS\_\_\_\_
- 8a. QUANTITY: LINEAR FT.\_\_25\_\_\_\_, SQUARE FT.\_\_20\_\_\_\_

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet 8 of 10

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER 8
2. LOCATION OF WORK TASK Bldg 1248 vent duct
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: White vent duct room 106
  - a. Type of Asbestos Chrysotile
  - b. Percent asbestos content 80%
4. ABATEMENT TECHNIQUE TO BE USED Remove
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class II
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable X Non-friable Category I         
Non-friable Category II
7. FORM Interior and CONDITION OF ACM: GOOD        FAIR x POOR
8. QUANTITY: METERS       , SQUARE METERS
- 8a. QUANTITY: LINEAR FT.       , SQUARE FT. 10

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet 9 of 10

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER 9
2. LOCATION OF WORK TASK Bldgs 1251 (rms 100-108, H-100), Bldg 223 (HVAC & Bathroom closets east & west wing)
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Ceiling Tile, 2'x4', w/ scattered pinholes and grooves, 2'x4' w/ scattered pinholes and grooves, beige backing in rm 109, 111, 112, H-101, H-102 Bldg 223 has transite sheeting ceiling and siding
  - a. Type of Asbestos \_\_\_\_\_
  - b. Percent asbestos content \_\_\_\_\_%
4. ABATEMENT TECHNIQUE TO BE USED Remove
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class II
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable x Non-friable Category I \_\_\_\_\_  
Non-friable Category II \_\_\_\_\_
7. FORM Interior and CONDITION OF ACM: GOOD \_\_\_\_\_ FAIR x POOR \_\_\_\_\_
8. QUANTITY: METERS \_\_\_\_\_, SQUARE METERS \_\_\_\_\_
- 8a. QUANTITY: LINEAR FT. \_\_\_\_\_, SQUARE FT. 3,460

TABLE 1

## INDIVIDUAL WORK TASK DATA ELEMENTS

- Sheet\_10\_\_\_\_\_ of \_\_\_\_10\_\_\_\_\_
- There is a separate data sheet for each individual work task.
1. WORK TASK DESIGNATION NUMBER    \_10\_\_\_\_\_
  2. LOCATION OF WORK TASK Bldg #s 1213, 1214, 1216, 1231, 1235, 1236,  
1248, 1251
  3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Window caulking, black,  
white grey and painted.
    - a. Type of Asbestos Chrysotile
    - b. Percent asbestos content up to 3%
  4. ABATEMENT TECHNIQUE TO BE USED Remove
  5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK Class II
  6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK  
Friable \_\_\_\_\_ Non-friable Category I YES\_\_\_\_\_  
Non-friable Category II\_\_\_\_\_
  7. FORM \_VARIES\_ and CONDITION OF ACM: GOOD\_X \_\_\_\_\_ FAIR\_\_\_\_\_ POOR\_\_\_\_\_
  8. QUANTITY: METERS\_\_\_\_\_, SQUARE METERS\_\_\_\_\_
  - 8a. QUANTITY: LINEAR FT.\_2,500 \_\_\_\_\_, SQUARE FT.\_\_\_\_\_

TABLE 2

FORMULA FOR CALCULATION OF THE 95 PERCENT CONFIDENCE LEVEL  
(Reference: NIOSH 7400)

---

$$\text{Fibers/cc(01.95 percent CL)} = X + [(X) * (1.645) * (CV)]$$

$$\text{Where: } X = ((E)(AC))/((V)(1000))$$

$$E = ((F/Nf) - (B/Nb))/Af$$

CV = The precision value; 0.45 shall be used unless the analytical laboratory provides the Contracting Officer with documentation (Round Robin Program participation and results) that the laboratory's precision is better.

AC = Effective collection area of the filter in square millimeters

V = Air volume sampled in liters

E = Fiber density on the filter in fibers per square millimeter

F/Nf = Total fiber count per graticule field

B/Nb = Mean field blank count per graticule field

Af = Graticule field area in square millimeters

$$TWA = C1/T1 + C2/T2 = Cn/Tn$$

Where: C = Concentration of contaminant

T = Time sampled.



TABLE 3  
NIOSH METHOD 7400  
PCM ENVIRONMENTAL AIR SAMPLING PROTOCOL (NON-PERSONAL)

Sample Location	Minimum No. of Samples	Filter Pore Size (Note 1)	Min. Vol. (Note 2) (Liters)	Sampling Rate (liters/min.)
Inside	0.5/140 Abatement Area	0.45 microns Square Meters (Notes 3 & 4)	1500	2-10
Each Room in		0.45 microns 1 Abatement Area Less than 140 Square meters	1500	2-10
Field Blank	2	0.45 microns	0	0
Laboratory	1	0.45 microns Blank	0	0

Notes:

1. Type of filter is Mixed Cellulose Ester.
2. Ensure detection limit for PCM analysis is established at 0.005 fibers/cc.
3. One sample shall be added for each additional 140 square meters. (The corresponding I-P units are 5/1500 square feet).
4. A minimum of 5 samples are to be taken per abatement area, plus 2 field blanks.

TABLE 4

EPA AHERA METHOD: TEM AIR SAMPLING PROTOCOL

Location Sampled	Minimum No. of Samples	Filter Pore Size	Min. Vol. (Liters)	Sampling Rate (liters/min.)
Inside	5	0.45 microns Abatement Area	1199	2-10
Outside	5	0.45 microns Abatement Area	1199	2-10
Field Blank	2	0.45 microns	0	0
Laboratory	1	0.45 microns Blank	0	0

## Notes:

1. Type of filter is Mixed Cellulose Ester.
2. The detection limit for TEM analysis is 70 structures/square mm.

## CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_  
PROJECT ADDRESS \_\_\_\_\_  
CONTRACTOR FIRM NAME \_\_\_\_\_  
EMPLOYEE'S NAME \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
(Print) (Last) (First) (MI)

Social Security Number: \_\_\_\_\_-\_\_\_\_\_-\_\_\_\_\_,

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH TYPES OF LUNG DISEASE AND CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NONSMOKING PUBLIC.

Your employer's contract for the above project requires that you be provided and you complete formal asbestos training specific to the type of work you will perform and project specific training; that you be supplied with proper personal protective equipment including a respirator, that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you. The Contractor's Designated Industrial Hygienist will check the block(s) for the type of formal training you have completed. Review the checked blocks prior to signing this certification.

## FORMAL TRAINING:

\_\_\_\_\_ a. For Competent Persons and Supervisors: I have completed EPA's Model Accreditation Program (MAP) training course, "Contractor/Supervisor", that meets this State's requirements.

## b. For Workers:

- \_\_\_\_\_ (1) For OSHA Class I work: I have completed EPA's MAP training course, "Worker", that meets this State's requirements.
- \_\_\_\_\_ (2) For OSHA Class II work (where there will be abatement of more than one type of Class II materials, i.e., roofing, siding, floor tile, etc.): I have completed EPA's MAP training course, "Worker", that meets this State's requirements.
- \_\_\_\_\_ (3) For OSHA Class II work (there will only be abatement of one type of Class II material):
- \_\_\_\_\_ (a) I have completed an 8-hour training class on the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls of 29 CFR 1926, Section .1101(g) and hands-on training.
- \_\_\_\_\_ (b) I have completed EPA's MAP training course, "Worker", that meets this State's requirements.
- \_\_\_\_\_ (4) For OSHA Class III work: I have completed at least a 16-hour course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, Section .92(a)(2) and the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926, Section .1101, and hands-on training.

## CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

\_\_\_\_\_ (5) For OSHA Class IV work: I have completed at least a 2-hr course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, (a)(1), and the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926, Section .1101(g) and hands-on training.

\_\_\_\_\_ c. Workers, Supervisors and the Designated Competent Person: I have completed annual refresher training as required by EPA's MAP that meets this State's requirements.

## PROJECT SPECIFIC TRAINING:

\_\_\_\_\_ I have been provided and have completed the project specific training required by this Contract. My employer's Designated Industrial Hygienist and Designated Competent Person conducted the training.

## RESPIRATORY PROTECTION:

\_\_\_\_\_ I have been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the dangers of handling and breathing asbestos dust and in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair and contact lens use policy of my employer.

## RESPIRATOR FIT-TEST TRAINING:

\_\_\_\_\_ I have been trained in the proper selection, fit, use, care, cleaning, maintenance, and storage of the respirator(s) that I will wear. I have been fit-tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

## MEDICAL EXAMINATION:

\_\_\_\_\_ I have had a medical examination within the last 12 months which was paid for by my employer. The examination included: health history, pulmonary function tests, and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing personal protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. My employer's Industrial Hygienist evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

\_\_\_\_\_ were no limitations to performing the required work tasks.  
\_\_\_\_\_ were identified physical limitations to performing the required work tasks.

Date of the medical examination \_\_\_\_\_

Employee Signature \_\_\_\_\_ date \_\_\_\_\_

Contractor's Industrial  
Hygienist Signature \_\_\_\_\_ date \_\_\_\_\_

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13851

FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE

08/98

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SECTION 13851

FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE  
**08/98**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S3.41 (1990; R 1996) Audible Emergency  
Evacuation Signals

CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 15 Radio Frequency Devices

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (1991; R 1995) Surge Voltages in  
Low-Voltage AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

NFPA 72 (1996; Errata Oct 96, Dec 96; TIA 96-1,  
96-2, 96-3) National Fire Alarm Code

NFPA 90A (1996) Installation of Air Conditioning  
and Ventilating Systems

NFPA 1221 (1994) Installation, Maintenance and Use  
of Public Fire Service Communication  
Systems

UNDERWRITERS LABORATORIES (UL)

UL 6 (1997) Rigid Metal Conduit

UL 38 (1994; Rev Nov 1994) Manually Actuated  
Signaling Boxes for Use with  
Fire-Protective Signaling Systems

UL 228 (1997) Door Closers-Holders, With or  
Without Integral Smoke Detectors

UL 268 (1996; Rev thru Jun 1998) Smoke Detectors

## for Fire Protective Signaling Systems

UL 268A	(1998) Smoke Detectors for Duct Applications
UL 464	(1996; Rev May 1997) Audible Signal Appliances
UL 521	(1993; Rev Oct 1994) Heat Detectors for Fire Protective Signaling Systems
UL 797	(1993; Rev thru Mar 1997) Electrical Metallic Tubing
UL 864	(1996) Control Units for Fire-Protective Signaling Systems
UL 1242	(1996; Rev Mar 1998) Intermediate Metal Conduit
UL 1971	(1995; Rev thru May 1997) Signaling Devices for the Hearing Impaired

## 1.2 GENERAL REQUIREMENTS

## 1.2.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that can provide service within 24 hours of notification.

## 1.2.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a noncorrosive and nonheat-sensitive plate which is securely attached to the equipment.

## 1.2.3 Keys and Locks

All locking devices (fire alarm control panel, pull stations, transmitter, etc.) should be provided with a Locksmith Distributors of America #LS-300 lockset and two keys per device (for instance, four pull stations will be provided with eight keys). This is known as the Fire Department Lock, locally.

## 1.2.4 Tags

Tags with stamped identification number shall be furnished for keys and locks.

## 1.2.5 Verification of Dimensions

After becoming familiar with details of the work, the Contractor shall verify dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

## 1.2.6 Compliance



The fire detection and alarm system and the central reporting system shall be configured in accordance with NFPA 72; exceptions are acceptable as directed by the Contracting Officer. The equipment furnished shall be compatible and be UL listed, FM approved, or approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards.

#### 1.2.7 Qualifications

##### 1.2.7.1 Engineer and Technician

a. Registered Professional Engineer with verification of experience and at least 4 years of current experience in the design of the fire protection and detection systems.

b. National Institute for Certification in Engineering Technologies (NICET) qualifications as an engineering technician in fire alarm systems program with verification of experience and current NICET certificate.

c. The Registered Professional Engineer may perform all required items under this specification. The NICET Fire Alarm Technician shall perform only the items allowed by the specific category of certification held.

##### 1.2.7.2 Installer

The installing Contractor shall provide the following: NICET Fire Alarm Technicians to perform the installation of the system. A NICET Level 3 Fire Alarm Technician shall supervise the installation of the fire alarm system. NICET Level 2 or higher Fire Alarm Technician shall install and terminate fire alarm devices, cabinets and panels. An electrician or NICET Level 1 Fire Alarm Technician shall install conduit for the fire alarm system. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

##### 1.2.7.3 Design Services

Installations requiring designs or modifications of fire detection, fire alarm, or fire suppression systems shall require the services and review of a qualified fire protection engineer. For the purposes of meeting this requirement, a qualified fire protection engineer is defined as an individual meeting one of the following conditions:

- a. An engineer having a Bachelor of Science or Masters of Science Degree in Fire Protection Engineering from an accredited university engineering program, plus a minimum of 2 years' work experience in fire protection engineering.
- b. A registered professional engineer (P.E.) in fire protection engineering.
- c. A registered PE in a related engineering discipline and member grade status in the National Society of Fire Protection Engineers.
- d. An engineer with a minimum of 10 years' experience in fire protection engineering and member grade status in the National Society of Fire Protection Engineers.

### 1.2.8 Programming

Programming of the Fire Alarm Transmitter and the the equipment at the Fire Department: The installer is required to obtain available ZID number (zone identification number) from the Fire Department. The installer shall fully program the transceiver and the equipment at the Fire Department to communicate by zone and remote test.

### 1.2.9 Installer

Installer is the person(s) who installs the fire alarm system.

### 1.2.10 Fire Alarm System

A group of interacting, interrelated elements forming a complete fire alarm system to include but not limited to fire alarm panel, radio transmitter, detection devices, supervisory signal, notification appliances, wiring, and conduit.

## 1.3 SYSTEM DESIGN

### 1.3.1 Operation

The fire alarm and detection system shall be a complete, supervised fire alarm system. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to signal line circuits (SLC), Style 6, in accordance with NFPA 72.

Alarm notification appliances shall be connected to notification appliance circuits (NAC), Style Z in accordance with NFPA 72. A looped conduit system shall be provided so that if the conduit and all conductors within are severed at any point, all NAC and SLC will remain functional. The conduit loop requirement is not applicable to the signal transmission link from the local panels (at the protected premises) to the Supervising Station (fire station, fire alarm central communication center). Textual, audible, and visual appliances and systems shall comply with NFPA 72. Fire alarm system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc. Addressable system shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits and shall provide the following features:

- a. Sufficient memory to perform as specified and as shown for addressable system.
- b. Individual identity of each addressable device for the following conditions: alarm; trouble; open; short; and appliances missing/failed remote detector - sensitivity adjustment from the panel for smoke detectors
- c. Capability of each addressable device being individually disabled or enabled from the panel.
- d. Each SLC shall be sized to provide 40 percent addressable expansion without hardware modifications to the panel.

### 1.3.2 Operational Features

The system shall have the following operating features:

- a. Monitor electrical supervision of SLC and NAC. Smoke detectors shall have combined alarm initiating and power circuits.
- b. Monitor electrical supervision of the primary power (ac) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.
- c. A trouble buzzer and trouble LED/LCD (light emitting diode/liquid crystal diode) to activate upon a single break, open, or ground fault condition which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power (ac) supply, low battery voltage, removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator LED/LCD. Subsequent trouble and supervisory alarms shall sound the trouble signal until silenced. After the system returns to normal operating conditions, the trouble buzzer shall again sound until the silencing switch returns to normal position, unless automatic trouble reset is provided.
- d. A one person test mode. Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.
- e. A transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but providing a trouble signal when disconnected and a restoration signal when reconnected.
- f. Evacuation alarm silencing switch which, when activated, will silence alarm devices, but will not affect the zone indicating LED/LCD nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed device and the NAC devices will be activated.
- g. Electrical supervision for circuits used for supervisory signal services (i.e., sprinkler systems, valves, etc.). Supervision shall detect any open, short, or ground.
- h. Confirmation or verification of all smoke detectors. The control panel shall interrupt the transmission of an alarm signal to the system control panel for a factory preset period. This interruption period shall be adjustable from 1 to 60 seconds and be factory set at 20 seconds. Immediately following the interruption period, a confirmation period shall be in effect during which time an alarm signal, if present, will be sent immediately to the control panel. Fire alarm devices other than smoke detectors shall be programmed without confirmation or verification.
- i. The fire alarm control panel shall provide supervised addressable relays for HVAC shutdown. An override at the HVAC panel shall not be provided.

- j. Provide one person test mode - Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.
- k. The fire alarm control panel shall provide the required monitoring and supervised control outputs needed to accomplish elevator recall.
- l. The fire alarm control panel shall monitor the fire sprinkler system, or other fire protection extinguishing system.
- m. The control panel and field panels shall be software reprogrammable to enable expansion or modification of the system without replacement of hardware or firmware. Examples of required changes are: adding or deleting devices or zones; changing system responses to particular input signals; programming certain input signals to activate auxiliary devices.
- n. Zones for NAC shall be arranged as indicated on the contract drawings.
- o. Continuous sounding of alarm notification appliances including the smoke detector sounder in all the living/sleeping rooms throughout the building.
- p. All initiating, supervisory and trouble signals to be transmitted.
- q. All initiating (detection) and indicating (evacuation signaling) circuits on the panel are supervised for open, short and ground fault conditions. A short including a double ground fault on a detection circuit, signals an alarm condition. An open, a wire-to-wire short, or a single ground fault on an indicating appliance circuit signals a trouble condition. The system shall have capabilities and have ability of a circuit to process alarm and trouble signal during an abnormal condition.
- r. All strobes within a building shall flash in synchronization.

#### 1.3.3 Alarm Functions

An alarm condition on a circuit shall automatically initiate the following functions:

- a. Transmission of signals over the station radio fire reporting system.
- b. Visual indications of the alarmed devices on the fire alarm control panel display and on the remote audible/visual display.
- c. Continuous sounding or operation of alarm notification appliances throughout the building as required by ANSI S3.41.
- d. Closure of doors held open by electromagnetic devices.
- e. Omitted.
- f. Deactivation of the air handling units throughout the building.

#### 1.3.4 Primary Power

Operating power shall be provided as required by paragraph Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of a false alarm. Loss of ac power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit.

#### 1.3.5 Battery Backup Power

Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

#### 1.3.6 Omitted

#### 1.3.7 Interface With other Equipment

Interfacing components shall be furnished as required to connect to subsystems or devices which interact with the fire alarm system, such as supervisory or alarm contacts in suppression systems, operating interfaces for smoke control systems, door releases, etc.

### 1.4 TECHNICAL DATA AND COMPUTER SOFTWARE

Technical data and computer software (meaning technical data which relates to computer software) which is specifically identified in this project, and which may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES, and in accordance with the Contract Data Requirements List, DD Form 1423. Data delivered shall be identified by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system, equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:

- (1) Identification of programmable portions of system equipment and capabilities.
- (2) Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- (3) Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- (4) Description of Fire Alarm Control Panel equipment operation.
- (5) Description of auxiliary and remote equipment operations.
- (6) Library of application software.
- (7) Operation and maintenance manuals as specified in SD-19 of the Submittals paragraph.

### 1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation;

submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

Storage Batteries; GA|F.

Substantiating battery calculations for supervisory and alarm power requirements. Ampere-hour requirements for each system component and each panel component, and the battery recharging period shall be included.

Voltage Drop; GA|F.

Voltage drop calculations for notification appliance circuits to indicate that sufficient voltage is available for proper appliance operation.

Spare Parts; FIO.

Spare parts data for each different item of material and equipment specified, not later than 3 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 year of service.

Technical Data and Computer Software; GA|F.

Technical data which relates to computer software.

#### SD-04 Drawings

Fire Alarm Reporting System; GA|F.

Detail drawings, prepared and signed by a Registered Professional Engineer or a NICET Level 3 Fire Alarm Technician, consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical detectors. The Contractor shall check the layout based on the actual detectors to be installed and make any necessary revisions in the detail drawings. The detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Detailed point-to-point wiring diagram shall be prepared and signed by a Registered Professional Engineer or a NICET Level 3 Fire Alarm Technician showing points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, and equipment that is activated or controlled by the panel.

#### SD-06 Instructions

Training; FIO.

Lesson plans, operating instructions, maintenance procedures, and training data, furnished in manual format, for the training courses. The operations training shall familiarize designated government personnel with proper operation of the fire alarm system. The maintenance training course shall provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

## SD-08 Statements

Testing; GA|F.

Detailed test procedures, prepared and signed by a Registered Professional Engineer or a NICET Level 3 Fire Alarm Technician, for the fire detection and alarm system 60 days prior to performing system tests.

## SD-09 Reports

Testing; GA|F.

Test reports, in booklet form, showing field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document readings, test results and indicate the final position of controls. The Contractor shall include the NFPA 72 Certificate of Completion and NFPA 72 Inspection and Testing Form, with the appropriate test reports.

## SD-13 Certificates

Equipment; FIO.

Certified copies of current approvals or listings issued by an independent test lab if not listed by UL, FM or other nationally recognized testing laboratory, showing compliance with specified NFPA standards.

Qualifications; GA|F.

Proof of qualifications for required personnel. The installer shall submit proof of experience for the Professional Engineer, fire alarm technician, and the installing company.

## SD-19 Operation and Maintenance Manuals

Technical Data and Computer Software; GA|F.

Six copies of operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features. Six copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements. Original and backup copies of all software delivered for this project shall be provided, on each type of media utilized. Manuals shall be approved prior to training.

## 1.6 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt, dust, and any other contaminants.

## PART 2 PRODUCTS

## 2.1 CONTROL PANEL

Control Panel shall comply with the applicable requirements of UL 864. Panel shall be modular, installed in a surface mounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly assembled panel containing components and equipment required to provide the specified operating and supervisory functions of the system. The panel shall have prominent rigid plastic, phenolic or metal identification plates for LED/LCDs, zones, SLC, controls, meters, fuses, and switches. Nameplates for fuses shall also include ampere rating. The LED/LCD displays shall be located on the exterior of the cabinet door or be visible through the cabinet door. Control panel switches shall be within the locked cabinet. A suitable means (single operation) shall be provided for testing the control panel visual indicating devices (meters or LEDs/LCDs). Meters and LEDs shall be plainly visible when the cabinet door is closed. Signals and LEDs/LCDs shall be provided to indicate by zone any alarm, supervisory or trouble condition on the system. Loss of power, including batteries, shall not require the manual reloading of a program. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals. Visual annunciation shall be provided for LED/LCD visual display as an integral part of the control panel and shall identify with a word description and id number each device. Cabinets shall be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment. If more than one modular unit is required to form a control panel, the units shall be installed in a single cabinet large enough to accommodate units. Cabinets shall be painted red or beige.

### 2.1.1 Omitted

### 2.1.2 Circuit Connections

Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each conductor and terminal marked for identification.

### 2.1.3 System Expansion and Modification Capabilities

Any equipment and software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.

### 2.1.4 Addressable Control Module

The control module shall be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems, and to control door holders or initiate elevator fire service. The module shall be UL listed as compatible with the control panel. The indicating device or the external load being controlled shall be configured as a Style Y notification appliance circuits. The system shall be capable of supervising, audible, visual and dry contact circuits. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The control module shall contain an integral LED that flashes each time the control module is polled.



### 2.1.5 Addressable Initiating Device Circuits Module

The initiating device being monitored shall be configured as a Style D initiating device circuits. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling. The module shall be UL listed as compatible with the control panel. The monitor module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall contain an integral LED that flashes each time the monitor module is polled. Pull stations with a monitor module in a common backbox are not required to have an LED.

### 2.2 STORAGE BATTERIES

Storage batteries shall be provided and shall be 24 Vdc sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 72 hours. Following this period of battery operation, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be located at the bottom of the panel or in a separate battery cabinet. Batteries shall be provided with overcurrent protection in accordance with NFPA 72. Separate battery cabinets shall have a lockable, hinged cover similar to the fire alarm panel. The lock shall be keyed the same as the fire alarm control panel. Cabinets shall be painted to match the fire alarm control panel.

### 2.3 BATTERY CHARGER

Battery charger shall be completely automatic, 24 Vdc with high/low charging rate, capable of restoring the batteries from full discharge (18 Volts dc) to full charge within 48 hours. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit assembly, if a high rate switch is provided. Charger shall be located in control panel cabinet or in a separate battery cabinet.

### 2.4 ADDRESSABLE MANUAL FIRE ALARM STATIONS

Addressable manual fire alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into signal line circuits. Stations shall be installed on semi-flush mounted outlet boxes. Manual stations shall be mounted at 1220 mm. Stations shall be single action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for the voltage and current upon which they operate. Addressable pull stations shall be capable of being field programmed, shall latch upon operation and remain latched until manually reset. Stations shall have a separate screw terminal for each conductor. Surface mounted boxes shall be matched and painted the same color as the mounting surface.

### 2.5 FIRE DETECTING DEVICES (ADDRESSABLE)

Fire detecting devices shall comply with the applicable requirements of NFPA 72, NFPA 90A, UL 268, UL 268A, and UL 521. The detectors shall be provided as indicated. Detector base shall have screw terminals for making connections. No solder connections will be allowed. Detectors located in concealed locations (above ceiling, raised floors, etc.) shall have a remote visible indicator LED/LCD. Addressable fire detecting devices, except flame detectors, shall be dynamically supervised and uniquely identified in the control panel. All fire alarm initiating devices shall be individually addressable, except where indicated.

#### 2.5.1 Heat Detectors

Heat detectors shall be designed for detection of fire by combination fixed temperature and rate-of-rise principle. Heat detector spacing shall be rated in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions, shall be types approved for such locations. Heat detectors located in attic spaces or similar concealed spaces below the roof shall be intermediate temperature rated.

##### 2.5.1.1 Combination Fixed-Temperature and Rate-of-Rise Detectors

Detectors shall be designed for semi-flush outlet box mounting and supported independently of wiring connections. Contacts shall be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector shall have a permanent external indication which is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only. The UL 521 test rating for the fixed temperature portion shall be 57.2 degrees C. The UL 521 test rating for the Rate-of-Rise detectors shall be rated for 15 by 15 m.

##### 2.5.1.2 Omitted

##### 2.5.1.3 Fixed Temperature Detectors

Detectors shall be designed for semi-flush outlet box mounting and supported independently of wiring connections. Detectors shall be designed to detect high heat. The detectors shall have a specific temperature setting of 57.2 degrees C. The UL 521 test rating for the fixed temperature detectors shall be rated for 4.57 by 4.57 m. Detectors in attic spaces shall have a setting of 93.3 degrees C.

#### 2.5.2 Smoke Detectors

Smoke detectors shall be designed for detection of abnormal smoke densities. Smoke detectors shall be photoelectric type. Detectors shall contain a visible indicator LED/LCD that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Detectors shall be the plug-in type in which the detector base contains terminals for making wiring connections. Detectors that are to be installed in concealed (above false ceilings, etc.) locations shall be provided with a remote indicator LED/LCD suitable for mounting in a finished, visible location.

##### 2.5.2.1 Omitted

##### 2.5.2.2 Photoelectric Detectors

Detectors shall operate on a light scattering concept using an LED light

source. Failure of the LED shall not cause an alarm condition. Detectors shall be factory set for sensitivity and shall require no field adjustments of any kind. Detectors shall have an obscuration rating in accordance with UL 268. Addressable smoke detectors shall be capable of having the sensitivity being remotely adjusted by the control panel. Detectors in the barracks shall be provided with sounder bases.

#### 2.5.2.3 Omitted

#### 2.5.2.4 Duct Detectors

Duct-mounted photoelectric smoke detectors shall be furnished and installed where indicated and in accordance with NFPA 90A. Units shall consist of a smoke detector as specified in paragraph Photoelectric Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry shall be mounted in a metallic enclosure exterior to the duct. Detectors shall have a manual reset. Detectors shall be rated for air velocities that include air flows between 2.5 and 20 m/s. Detectors shall be powered from the fire alarm panel. Sampling tubes shall run the full width of the duct. The duct detector package shall conform to the requirements of NFPA 90A, UL 268A, and shall be UL listed for use in air-handling systems. The control functions, operation, reset, and bypass shall be controlled from the fire alarm control panel. Lights to indicate the operation and alarm condition; and the test and reset buttons shall be visible and accessible with the unit installed and the cover in place. Detectors mounted above 1.83 m and those mounted below 1.83 m that cannot be easily accessed while standing on the floor, shall be provided with a remote detector indicator panel containing test and reset switches. Remote lamps and switches as well as the affected fan units shall be properly identified in etched plastic placards. Detectors shall have auxiliary contacts to provide control, interlock, and shutdown functions specified in Section 15950 HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS. The detectors shall be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

### 2.6 NOTIFICATION APPLIANCES

Audible appliances shall conform to the applicable requirements of UL 464. Devices shall be connected into notification appliance circuits. Devices shall have a separate screw terminal for each conductor. Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area. Recessed audible appliances shall be installed with a grill that is painted with a factory finish to match the surface to which it is mounted.

#### 2.6.1 Omitted

#### 2.6.2 Alarm Horns

Horns shall be surface mounted, with the matching mounting back box recessed single projector, vibrating type suitable for use in an electrically supervised circuit. Horns shall produce a sound rating of at least 85 dBA at 3.05 m. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

#### 2.6.3 Omitted

#### 2.6.4 Visual Notification Appliances

Visual notification appliances shall conform to the applicable requirements of UL 1971 and the contract drawings. Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light. Strobe flash rate shall be between 1 to 3 flashes per second and a minimum of 75 candela. Strobe shall be semi-flush mounted. All strobes within a building shall flash in synchronization.

#### 2.6.5 Combination Audible/Visual Notification Appliances

Combination audible/visual notification appliances shall provide the same requirements as individual units except they shall mount as a unit in standard backboxes. Units shall be factory assembled. Any other audible notification appliance employed in the fire alarm systems shall be approved by the Contracting Officer.

### 2.7 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

#### 2.7.1 Electromagnetic Door Hold-Open Devices

Devices shall be attached to the walls unless otherwise indicated. Devices shall comply with the appropriate requirements of UL 228. Devices shall operate on 24 Volt dc power. Compatible magnetic component shall be attached to the door. Under normal conditions, the magnets shall attract and hold the doors open. When magnets are de-energized, they shall release the doors. Magnets shall have a holding force of 111.2 N (25 pounds). Devices shall be UL or FM approved. Housing for devices shall be brushed aluminum or stainless steel. Operation shall be fail safe with no moving parts. Electromagnetic door hold-open devices shall not be required to be held open during building power failure.

#### 2.7.2 Conduit

Conduit and fittings shall comply with NFPA 70, UL 6, UL 1242, and UL 797.

#### 2.7.3 Wiring

Wiring shall conform to NFPA 70. Wiring for 120 Vac power shall be No. 12 AWG minimum. The SLC wiring shall be copper cable in accordance with the manufacturers requirements. Wiring for fire alarm dc circuits shall be No. 16 or 14 AWG minimum. Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except that rigid plastic conduit may be used under slab-on-grade. Conductors shall be color coded. Conductors used for the same functions shall be similarly color coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-tap connections to initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. T-tapping using screw terminal blocks is allowed for style 5 addressable systems.

#### 2.7.4 Special Tools and Spare Parts

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer. Two spare fuses of each type and size required shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Spare fuses

shall be mounted in the fire alarm panel.

## 2.8 TRANSMITTERS

### 2.8.1 Radio Alarm Transmitters

Transmitters shall be compatible with proprietary supervising station receiving equipment. Each radio alarm transmitter shall be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Transmitters shall be provided in accordance with applicable portions of NFPA 72, NFPA 1221, and 47 CFR 15. Transmitter electronics module shall be contained within the physical housing as an integral, removable assembly. The proprietary supervising station receiving equipment is a Monaco system and the transceiver shall be fully compatible with this equipment. At the contractor's option, and if UL listed, the transmitter may be housed in the same panel as the fire alarm control panel. The transmitter shall operate on a frequency as directed by the Fire Department.

#### 2.8.1.1 Transmitter Power Supply

Each radio alarm transmitter shall be powered by a combination of locally available 120-volt ac power and a sealed, lead-calcium battery.

a. Operation: Each transmitter shall operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter shall automatically switch to battery operation. Switch over shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic.

b. Battery Power: Transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.

#### 2.8.1.2 Radio Alarm Transmitter Housing

Transmitter housing shall be NEMA Type 1. The housing shall contain a lock that is keyed identical to the fire alarm system for the building. Radio alarm transmitter housing shall be factory painted with a suitable priming coat and not less than two coats of a hard, durable weatherproof enamel.

#### 2.8.1.3 Antenna System

The antenna system shall utilize vertical polarization antennas, communication links between transmitters/receivers and antennas, and matching networks as needed for the proper coverage. The antenna system shall be either omni-directional or shaped-covered as selected by the Contractor based on the topography. The antenna system and cabling shall be furnished to provide adequate system gain. Antennas installed outdoors shall be capable of withstanding the environmental conditions of 201.2 km per hour wind and 12.7 mm ice without failure. Lightning protection shall comply with NFPA 780. Antenna supporting structures shall comply with EIA 222-E.

##### a. Grounding Conductors

Antenna grounding conductors shall be minimum 32-strand, No. 17 AWG copper.

b. Communication Links

Transmission line between the transmitter/receiver and the antenna shall be 50-ohm impedance rated for the transmitter output power. Minimum requirements shall be cable that exhibits an attenuation not exceeding 1.1 dB power 30.5 m at 200 MHz.

c. Antenna Location

Antenna shall be located in the attic of each building unless otherwise indicated. Antenna shall be location tested before permanent installation to verify reliable and proper signals are received at the fire station consoles. If this location proves to be unsatisfactory the antenna will be located at an alternate location approved by the Contracting Officer. The antenna shall be installed in accordance with the manufacturer's recommendations. The exact location of any antenna either inside or outside of the buildings shall be approved by the Contracting Officer prior to permanent installation.

d. Antenna Assembly

The Contractor shall provide and install an antenna assembly, antenna wall-mount bracket, lightning arrestor kit, coaxial cable and connector and other accessories necessary for a complete installation.

2.8.2 Radio Transmitter Interface Device

The interface device shall provide a means of converting whatever signals are available from the local control equipment into a form that is compatible with the transmitter inputs while still maintaining electrical supervision of the entire system. Interface devices shall be utilized whenever direct connection between local control equipment and the transmitter is not possible. Interface devices shall be completely assembled, wired, tested at the factory, and delivered ready for installation and operation.

2.8.3 Memory

Transmitters shall have memory capability. Multiple, simultaneous alarms shall not result in the loss of any messages. All such messages shall be stored until they are transmitted.

2.8.4 Transmitter Identity Code

Each transmitter shall transmit a distinct identity code number as part of all signals emanating from the transmitter. The identity code shall allow for no less than a 10 digit code selection and be transmitted not less than three complete rounds (cycles). The installer is required to obtain the zone identification numbers (ZID) from the Fire Department.

2.8.5 Message Designations

Each transmitter shall allow as a minimum no less than 10 distinct and individually identifiable message designations as to the types or causes of transmitter actuation.

- a. Master Message: Master messages shall be transmitted upon automatic actuation of the transmitter. The building and zone causing

actuation shall be individually identified as part of this transmission.

b. Test Message: This message shall be capable of both manual and automatic actuation. When a transceiver method is employed, it shall provide for automatic interrogation at preselected periods or continuous automatic interrogation in accordance with the governing standard. Additionally, transceiver systems shall provide for selective interrogation at times determined by the user. Testing the automatic test actuation will occur a minimum of once in each 24-hour period, at an optionally preselected time. Stability of the electronic actuating device shall be plus or minus 1 minute per month within the temperature range stipulated for system operation. Actuation of the "Test" message designation, regardless of initiating means, shall cause no less than one complete message to be sent.

c. Tamper Message Designation: This message shall be automatically transmitted when a tamper switch is tripped in the transmitter housing.

d. Trouble Message Designation: This message shall be automatically transmitted in the event of a failure in excess of 1 minute of the main operating power source of the transmitter.

#### 2.8.6 Programming

Programming of the fire alarm transmitter and the equipment at the Fire Department: The installer is required to obtain available ZID numbers (zone identification number) from the Fire Department. The installer shall fully program the transceiver and the equipment at the Fire Department to communicate by zone and remote test.

##### 2.8.6.1 Installer

Installer is the person(s) who installs the fire alarm system.

##### 2.8.6.2 Fire Alarm System

A group of interacting, interrelated elements forming a complete fire alarm system to include but not limited to fire alarm panel, radio transmitter, detection devices, supervisory signal, notification appliances, wiring and conduit.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Smoke detectors shall not be installed until construction is essentially complete and the building has been thoroughly cleaned.

##### 3.1.1 Power Supply for the System

A single dedicated circuit connection for supplying power from a branch circuit to each building fire alarm system shall be provided. The power shall be supplied as shown on the drawings. The power supply shall be equipped with a locking mechanism and marked in red with the words "FIRE ALARM CIRCUIT CONTROL".

##### 3.1.2 Wiring

Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. Not more than two conductors shall be installed under any device screw terminal. The wires under the screw terminal shall be straight when placed under the terminal then clamped in place under the screw terminal. The wires shall be broken and not twisted around the terminal. Circuit conductors entering or leaving any mounting box, outlet box enclosure, or cabinet shall be connected to screw terminals with each terminal and conductor marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors in the system is prohibited. Wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

### 3.1.3 Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 300 mm nor more than 2000 mm above the finished floor. Manually operable controls shall be between 900 and 1100 mm above the finished floor. Panel shall be installed to comply with the requirements of UL 864.

### 3.1.4 Detectors

Detectors shall be located and installed in accordance with NFPA 72. Detectors shall be connected into signal line circuits or initiating device circuits as indicated on the drawings. Detectors shall be at least 300 mm from any part of any lighting fixture. Detectors shall be located at least 900 mm from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in open space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 900 mm, sway bracing shall be provided. Detectors installed in concealed locations (above ceiling, raised floors, etc.) shall have a remote visible indicator LED/LCD in a finished, visible location.

### 3.1.5 Notification Appliances

Notification appliances shall be mounted 2003 mm above the finished floor or 150 mm below the ceiling, whichever is lower.

### 3.1.6 Annunciator Equipment

Annunciator equipment shall be mounted where indicated on the drawings.

### 3.1.7 Addressable Initiating Device Circuits Module

The initiating device circuits module shall be used to connect supervised conventional initiating devices (water flow switches, water pressure switches, manual fire alarm stations, high/low air pressure switches, and tamper switches). The module shall mount in an electrical box adjacent to or connected to the device it is monitoring and shall be capable of Style B supervised wiring to the initiating device. In order to maintain proper supervision, there shall be no T-taps allowed on style B lines.



Addressable initiating device circuits modules shall monitor only one initiating device each. Contacts in suppression systems and other fire protection subsystems shall be connected to the fire alarm system to perform supervisory and alarm functions as specified in Section 13930 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION and NFPA 72, as indicated on the drawings and as specified herein.

### 3.1.8 Addressable Control Module

Addressable and control modules shall be installed in the outlet box or adjacent to the device they are controlling. If a supplementary suppression releasing panel is provided, then the monitor modules shall be mounted in a common enclosure adjacent to the suppression releasing panel and both this enclosure and the suppression releasing panel shall be in the same room as the releasing devices. All interconnecting wires shall be supervised unless an open circuit or short circuit abnormal condition does not affect the required operation of the fire alarm system. If control modules are used as interfaces to other systems, such as HVAC or elevator control, they shall be within the control panel or immediately adjacent to it. Control modules that control a group of notification appliances shall be adjacent to the first notification appliance in the notification appliance circuits. Control modules that connect to devices shall supervise the notification appliance circuits. Control modules that connect to auxiliary systems or interface with other systems (non-life safety systems) and where not required by NFPA 72, shall not require the secondary circuits to be supervised. Contacts in suppression systems and other fire protection subsystems shall be connected to the fire alarm system to perform required alarm functions as specified in Section 13930 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION and NFPA 72, as indicated on the drawings and as specified herein.

## 3.2 OVERVOLTAGE AND SURGE PROTECTION

### 3.2.1 Power Line Surge Protection

All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 B3 combination waveform and NFPA 70. Fuses shall not be used for surge protection. The surge protector shall be rated for a maximum let thru voltage of 350 Volts ac (line-to-neutral) and 350 Volt ac (neutral-to-ground).

### 3.2.2 Low Voltage DC Circuits Surge Protection

All IDC, NAC, and communication cables/conductors, except fiber optics, shall have surge protection installed at each point where it exits or enters a building. Equipment shall be protected from surges per IEEE C62.41 B3 combination waveform and NFPA 70. The surge protector shall be rated to protect the 24 Volt dc equipment. The maximum dc clamping voltages shall be 36 V (line-to-ground) and 72 Volt dc (line-to-line).

### 3.2.3 Signal Line Circuit Surge Protection

All SLC cables/conductors, except fiber optics, shall have surge protection/isolation circuits installed at each point where it exits or enters a building. The circuit shall be protected from surges per IEEE C62.41 B3 combination waveform and NFPA 70. The surge protector/isolator shall be rated to protect the equipment.

## 3.3 GROUNDING

Grounding shall be provided by connecting to building ground system.

#### 3.4 OMITTED

#### 3.5 TESTING

The Contractor shall notify the Contracting Officer at least 10 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative shall be present to supervise tests. The Contractor shall furnish instruments and personnel required for the tests.

##### 3.5.1 Preliminary Tests

Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance, when required. Tests shall include the meggering of system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional. After completing the preliminary testing the Contractor shall complete and submit the NFPA 72, Certificate of Completion.

##### 3.5.2 Acceptance Test

Acceptance testing shall not be performed until the Contractor has completed and submitted the Certificate of Completion. Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that previous deficiencies have been corrected. The Contractor shall complete and submit the NFPA 72, Inspection and Testing Form. The test shall include all requirements of NFPA 72 and the following:

- a. Test of each function of the control panel.
- b. Test of each circuit in both trouble and normal modes.
- c. Tests of each alarm initiating devices in both normal and trouble conditions.
- d. Tests of each control circuit and device.
- e. Tests of each alarm notification appliance.
- f. Tests of the battery charger and batteries.
- g. Complete operational tests under emergency power supply.
- h. Visual inspection of wiring connections.
- i. Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.
- j. Ground fault

k. Short circuit faults

l. Stray voltage

m. Loop resistance

### 3.6 TRAINING

Training course shall be provided for the operations and maintenance staff.

The course shall be conducted in the building where the system is installed or as designated by the Contracting Officer. The training period for systems operation shall consist of 1 training day (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The training period for systems maintenance shall consist of 2 training days (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The instructions shall cover items contained in the operating and maintenance instructions. In addition, training shall be provided on performance of expansions or modifications to the fire detection and alarm system. The training period for system expansions and modifications shall consist of at least 1 training day (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests.

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SECTION 13875

PRE-ENGINEERED, PREFABRICATED METAL SHELTER

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SAVH-13875 (April 1999)

## SECTION 13875

PRE-ENGINEERED, PREFABRICATED METAL SHELTER  
**04/99**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## ALUMINUM ASSOCIATION (AA)

AA-02 (1994) Aluminum Design Manual:  
Specification & Guidelines for Aluminum  
Structures

## AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC-04 (1989) Specification for Structural Steel  
Buildings - Allowable Stress Design,  
Plastic Design

AISC Pub No. S342 L (1993) Load and Resistance Factor Design  
Specification for Structural Steel  
Buildings

## AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI-01 (1996) Cold-Formed Steel Design Manual

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (1995) Minimum Design Loads for Buildings  
and Other Structures

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2244 (1993) Calculation of Color Differences  
from Instrumentally Measured Color  
Coordinates

ASTM D 4214 (1997) Evaluating the Degree of Chalking  
of Exterior Paint Films

## METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA-01 (1996) Low Rise Building Systems Manual

## UNDERWRITERS LABORATORIES (UL)

UL 580 (1994; Rev thru Sep 1997) Tests for Uplift  
Resistance of Roof Assemblies

## 1.2 GENERAL REQUIREMENTS

The metal shelter system covered under this specification shall be provided by a single manufacturer and shall include all components and assemblies that form a shelter. All erection, field finishing, electrical work, slabs and foundations and coordination with fabricator will be by Contractor. Contractor to provide all items not provided by shelter manufacturer for a complete and usable product as shown. Shelter shall be fabricated to provide concealed electrical access for overhead light and for switch and receptacle recessed in column as indicated.

### 1.2.1 Shelter Configurations

Roof slope shall be as shown on the drawings. Shelter shall be single-span structure with one of the following framing systems: self-framing or rigid frame. Shelter shall be a manufacturer's advertised product, except that dimensions shall be not less than those indicated. The minimum inside clear dimensions shall be as shown on the drawings.

### 1.2.2 Qualifications

#### 1.2.2 [Enter Appropriate Subpart Title Here]1.2.2.1 Manufacturer

Metal shelter shall be the product of a recognized steel shelter systems manufacturer who has been in the practice of manufacturing steel shelters for a period of not less than 5 years. The manufacturer shall be chiefly engaged in the practice of designing and fabricating metal shelter systems.

#### 1.2.2.2 Installer

Erector shall have experience in the erection of steel shelter systems for a period of at least 3 years. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads acting on the exposed framing, such as wind loads and seismic forces, as well as loads due to erection equipment and erection operation. Structural members shall not be field cut or altered. Abrasions shall be touched up after erection.

## 1.3 DESIGN REQUIREMENTS

Criteria, loads, loading combinations, and definitions shall be in accordance with ASCE 7.

### 1.3.1 Foundations

Foundations shall be designed for an allowable soil bearing pressure of 144 KPa, a factor of safety of 1.5 for overturning, sliding and uplift, and a concrete compressive strength as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Foundation and slab design shall incorporate installation of pedestal type grills and picnic tables, in accordance with their manufacturer's recommendations as well as shelter.

### 1.3.2 Structural Members and Connections

Structural steel members and their connections shall be designed in accordance with AISC-04 or AISC Pub No. S342 L. Structural cold-formed steel framing members and their connections shall be designed in accordance with AISI-01. Aluminum structural members and their connections shall be designed in accordance with AA-02.

### 1.3.3 Roofing Design

Steel or aluminum roofing shall be designed in accordance with MBMA-01.

### 1.3.4 Grounding and Lightning Protection

Grounding and lightning protection shall be provided as specified in Section 13100 LIGHTNING PROTECTION SYSTEM.

## 1.4 DESIGN ANALYSIS

The Contractor shall obtain the services of a licensed Professional Engineer to design the foundations.

## 1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

Instruction Manuals; FIO.

Manufacturer's literature for individual building component systems.

### SD-04 Drawings

Metal Shelter System; GA.

Detail drawings consisting of catalog cuts, design and erection drawings. Include coordination data for other trades.

### SD-13 Certificates

Metal Shelter System; FIO.

a. A Certificate from the metal building shelter stating that the metal shelter was designed in accordance with the requirements stated in this specification.

b. Mill certification for structural bolts, framing steel and roofing.

c. Warranty certificate. At the completion of the project the Contractor shall furnish signed copies of the required warranties.

### SD-14 Samples

Finishes; GA.

Samples of prefinished materials showing color and finish.

## 1.6 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials other than framing and structural members shall be covered with weathertight coverings and

kept dry. Storage accommodations for roofing shall provide good air circulation and protection from surface staining.

## 1.7 WARRANTIES

The metal shelter system (roofing and related components provided as part of the system) shall be warranted as described below against material and workmanship deficiencies, system deterioration caused by ordinary exposure to the elements and service design loads, leaks and wind uplift damage. Any emergency temporary repairs conducted by the Government shall not negate the warranties.

### 1.7.1 Manufacturer's Materials Warranties

The Contractor shall furnish, in writing, the following manufacturer's material warranties to the Contracting Officer which cover all Metal Shelter System components:

a. A manufacturer's 5-year material warranty warranting that the specified aluminum, zinc-coated steel, aluminum-zinc alloy coated steel or aluminum-coated steel will not rupture, structurally fail, fracture, deteriorate, or become perforated under normal design atmospheric conditions and service design loads. Liability under this warranty shall be limited exclusively to the cost of either repairing or replacing nonconforming, ruptured, perforated, or structurally failed securement system, including fasteners and coil material.

b. A manufacturer's 5-year exterior material finish warranty on the factory colored finish warranting that the finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of eight, as determined by ASTM D 4214 test procedures; or change colors in excess of five CIE or Hunter Lab color difference ( $\Delta E$ ) units in accordance with ASTM D 2244. Liability under this warranty is exclusively limited to replacing the defective coated material.

## PART 2 PRODUCTS

### 2.1 FRAMING AND STRUCTURAL MEMBERS

All structural framing shall be steel tubes or structural steel sections with bolt connections concealed within tubing. All welding will be shop welding by certified welders in accordance with AISC or AISI as applicable. There will be no field welding. Holes for structural connections shall be made in the shop.

#### 2.1.1 Factory Color Finish

Framing and structural members shall have a factory applied polyvinylidene fluoride finish on the exposed side. The finish shall consist of a baked-on topcoat with an appropriate prime coat. Color shall be Fed. Std. 595B #20040. The coating shall be a nominal 0.025 mm (1 mil) thickness consisting of a topcoat of not less than 0.018 mm (0.7 mil) dry film thickness and the paint manufacturer's recommended primer of not less than 0.005 mm (0.2 mil) thickness.

### 2.2 ROOFING AND SIDING

Roofing shall be standing seam, either 24 gage galvanized steel or high



strength aluminum and shall have a factory color finish.

#### 2.2.1 Roofing

Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope. Width of sheets with interlocking ribs shall provide not less than 305 mm (12 inches) of coverage in place. Roof deck assemblies shall be Class 90 as defined in UL 580.

#### 2.2.2 Factory Color Finish

Roof panels shall have a factory applied polyvinylidene fluoride finish on both sides. The finish shall consist of a baked-on topcoat with an appropriate prime coat. Exterior color shall match Fed. Std. 595b #20040. The coating shall be a nominal 0.025 mm thickness consisting of a topcoat of not less than 0.018 mm dry film thickness and the paint manufacturer's recommended primer of not less than 0.005 mm thickness. The interior color shall be white.

#### 2.2.3 Accessories

Flashing, trim, metal closure strips, fascia, caps, and similar metal accessories shall be the manufacturer's standard products. Exposed metal accessories shall be finished to match the building finish.

### 2.3 FASTENERS

Fasteners shall be as recommended by the manufacturer to meet the design strength requirements. Exposed fasteners shall be finished to match the building finish. Exposed fasteners penetrating underside of roof panels will not be permitted.

## PART 3 EXECUTION

### 3.1 ERECTION

Dissimilar materials which are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Stained, discolored or damaged sheets shall be removed from the site.

#### 3.1.1 Framing Members and Anchor Bolts

Onsite flame cutting of framing members and field welding will not be permitted. Concrete work is specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Anchor bolts shall be accurately set by template while the concrete is in a plastic state. Members shall be accurately spaced to assure proper fitting of panels. As erection progresses, the work shall be securely fastened to resist the dead load and wind and erection stresses.

#### 3.1.2 Roofing Installation

Roofing shall be applied with the longitudinal configurations in the direction of the roof slope. Accessories shall be fastened into framing members, except as otherwise approved. Fastener and fastener spacing shall be in accordance with manufacture design.

### 3.2 FIELD PAINTING

Factory color finished surfaces shall be touched up as necessary with the manufacturer's recommended touch-up paint.

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## SECTION 13930

## WET PIPE SPRINKLER SYSTEM AND HOSE STANDPIPE SYSTEM, FIRE PROTECTION

**04/98**

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CEGS-13930 (April 1998)

Includes changes through Notice 2 (June 1999)

## SECTION 13930

WET PIPE SPRINKLER SYSTEM AND HOSE STANDPIPE SYSTEM, FIRE PROTECTION  
**04/98**

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47	(1990; R 1995) Ferritic Malleable Iron Castings
ASTM A 53	(1998) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 135	(1997) Electric-Resistance-Welded Steel Pipe
ASTM A 183	(1983; R 1998) Carbon Steel Track Bolts and Nuts
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 795	(1997) Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use

## AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(1993) Double Check Backflow Prevention Assembly
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## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA EWW	(1995) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(1992) Hypochlorites
AWWA B301	(1992) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other

## Liquids

AWWA C111 (1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C151 (1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

AWWA C203 (1997) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

AWWA M20 (1973) Manual: Water Chlorination Principles and Practices

## FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825a (1998) Approval Guide Fire Protection

FM P7825b (1998) Approval Guide Electrical Equipment

## MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71 (1997) Cast Iron Swing Check Valves, Flanges and Threaded Ends

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (1996; Errata 13-96-1) Installation of Sprinkler Systems

NFPA 13R (1996) Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height

NFPA 14 Installation of Standpipe and Hose Systems

NFPA 24 (1995) Installation of Private Fire Service Mains and Their Appurtenances

NFPA 231C (1998) Rack Storage of Materials

NFPA 1963 (1998) Fire Hose Connections

## NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014 (1995) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout

## UNDERWRITERS LABORATORIES (UL)

UL 668 (1995; Rev thru Dec 1998) Hose Valves For Fire Protection Service

UL Bld Mat Dir (1998) Building Materials Directory

UL Fire Prot Dir (1998) Fire Protection Equipment Directory

## 1.2 GENERAL REQUIREMENTS

Wet pipe sprinkler system shall be provided in areas indicated on the drawings. The sprinkler system shall provide fire sprinkler protection for the entire area. Except as modified herein, the system shall be designed and installed in accordance with NFPA 13 and NFPA 13R. Pipe sizes which are not indicated on drawings shall be determined by hydraulic calculation.

Manual wet hose standpipe systems shall be provided in the barracks buildings as shown on the drawings. Except as modified herein and on the drawings, the standpipe systems shall be designed and installed in accordance with NFPA 14.

### 1.2.1 Hydraulic Design

Sprinkler systems shall be hydraulically designed to discharge the minimum densities over the hydraulically most demanding design areas as indicated on the drawings. The minimum pipe size for branch lines in gridded systems shall be 32 mm (1-1/4 inch). Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13.

#### 1.2.1.1 Hose Demand

An allowance for exterior hose streams as indicated on the drawings shall be added to the sprinkler system demand at the point of connection to the existing system.

#### 1.2.1.2 Basis for Calculations

The design of the system shall be based upon a water supply with static pressure, residual pressure and flow as indicated on the drawings. Water supply shall be presumed available at the point of connection to existing. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping, 150 for copper tubing, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping.

### 1.2.2 Sprinkler Spacing

Sprinklers shall be uniformly spaced on branch lines. Maximum spacing per sprinkler shall not exceed limits specified in NFPA 13 for light and ordinary hazard occupancy.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. Submittals related to system configuration, hydraulic calculations, and equipment selection, including manufacturer's catalog data, working drawings, connection drawings, control diagrams and certificates shall be submitted concurrently as a complete package. The package will be reviewed by the U.S. Army Engineer District Fire Protection Engineer. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Load Calculations for Sizing Sway Bracing; GA|F.

For systems that are required to be protected against damage from earthquakes, load calculations shall be provided for sizing of sway bracing.

Sprinkler System Equipment; GA|D.

Manufacturer's Catalog Data for each separate piece of equipment proposed for use in the system. Data shall indicate the name of the manufacturer of each item of equipment, with data highlighted to indicate model, size, options, etc. proposed for installation. In addition, a complete equipment list which includes equipment description, model number and quantity shall be provided.

Hydraulic Calculations; GA|D.

Hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments.

Spare Parts; FIO.

Spare parts data shall be included for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. A list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor shall be included.

#### SD-04 Drawings

Sprinkler System Shop Drawings; GA|D.

Detail drawings conforming to the requirements established for working plans as prescribed in NFPA 13. Drawings shall include plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

- a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used.
- b. Floor plans drawn to a scale not less than 1:100 which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.
- c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.
- d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of



each typical sprinkler above finished floor.

- e. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

As-Built Drawings; FIO.

As-built drawings, no later than 14 working days after completion of the Final Tests. The sprinkler system shop drawings shall be updated to reflect as-built conditions after work is completed and shall be on reproducible full-size mylar film.

#### SD-06 Instructions

Test Procedures; GA|F.

Proposed test procedures for piping hydrostatic test, testing of alarms, at least 14 days prior to the start of related testing.

#### SD-07 Schedules

Preliminary Tests; GA|F.

A schedule of preliminary tests, at least 14 days prior to the proposed start of the tests.

Final Test; GA|F.

Upon successful completion of tests specified under paragraph PRELIMINARY TESTS, written notification shall be given to the Contracting Officer of the date for the final acceptance test. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates.

#### SD-08 Statements

Installer Qualifications; GA|F.

Qualifications of the sprinkler installer.

Submittal Preparer's Qualifications; GA|F.

The name and documentation of certification of the individual who will prepare the submittals, prior to the submittal of the drawings and hydraulic calculations.

#### SD-13 Certificates

Contractor's Material & Test Certificates; FIO.

Certificates, as specified in NFPA 13, shall be completed and signed by the Contractor's Representative performing required tests for both underground and aboveground piping.

#### SD-19 Operation and Maintenance Manuals

Sprinkler System; FIO.

Manuals shall be in loose-leaf binder format and grouped by technical sections consisting of manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. The manuals shall list routine maintenance procedures possible breakdowns, and repairs, and troubleshooting guide. This shall include procedures and instructions pertaining to frequency of preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.

#### 1.4 HYDRAULIC CALCULATIONS

Hydraulic calculations shall be as outlined in NFPA 13 except that calculations shall be performed by computer using software specifically designed for fire protection system design. Software which uses k-factors for typical branch lines is not acceptable. Calculations shall be taken back to the water supply source unless water supply data is otherwise indicated. Calculations shall substantiate that the design area indicated is the hydraulically most demanding. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

#### 1.5 SUBMITTAL PREPARER'S QUALIFICATIONS

The sprinkler system submittals, including as-built drawings, shall be prepared by an individual who is either a registered professional engineer or who is certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014.

#### 1.6 INSTALLER QUALIFICATIONS

The installer shall be experienced and regularly engaged in the installation of the type and complexity of system included in this project. A statement prior to submittal of any other data or drawings, that the proposed sprinkler system installer is regularly engaged in the installation of the type and complexity of system included in this project shall be provided. In addition, data identifying the location of at least three systems recently installed by the proposed installer which are comparable to the system specified shall be submitted. Contractor shall certify that each system has performed satisfactorily, in the manner intended, for a period of not less than 6 months.

#### 1.7 REGULATORY REQUIREMENTS

Compliance with referenced NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. Applicable material and installation standards referenced in Appendix A of NFPA 13 and NFPA 24 shall be considered mandatory the same as if such referenced standards were specifically listed in this specification. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification shall govern. All requirements that exceed the minimum requirements of NFPA 13 shall be incorporated into the design. Reference to "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

#### 1.8 DELIVERY AND STORAGE

Equipment placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust or other contaminants.

### PART 2 PRODUCTS

#### 2.1 GENERAL EQUIPMENT REQUIREMENTS

##### 2.1.1 Standard Products

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

##### 2.1.2 Requirements for Fire Protection Service

Equipment and materials shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM P7825a and FM P7825b. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM P7825a and FM P7825b.

##### 2.1.3 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate permanently affixed to the item of equipment.

#### 2.2 UNDERGROUND PIPING SYSTEMS

##### 2.2.1 Pipe

Piping from a point 150 mm above the floor to a point 1500 mm outside the building wall shall be ductile iron with a rated working pressure of 1034 kPa (150 psi) conforming to AWWA C151, with cement mortar lining conforming to AWWA C104. Piping more than 1500 mm outside the building walls shall comply with Section 02510 WATER DISTRIBUTION SYSTEM.

##### 2.2.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111.

## 2.3 ABOVEGROUND PIPING SYSTEMS

Aboveground piping shall be steel.

### 2.3.1 Steel Piping System

#### 2.3.1.1 Steel Pipe

Except as modified herein, steel pipe shall be black as permitted by NFPA 13 and shall conform to applicable provisions of ASTM A 795, ASTM A 53, or ASTM A 135. Pipe shall be minimum Schedule 10 or Schedule 40. Pipe in which threads or grooves are cut shall be Schedule 40. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

#### 2.3.1.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings which use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

#### 2.3.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 1200 kPa (175 psi) service and shall be the product of the same manufacturer. Fitting and coupling houses shall be malleable iron conforming to ASTM A 47, Grade 32510; ductile iron conforming to ASTM A 536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A 183 and shall be cadmium plated or zinc electroplated.

#### 2.3.1.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1.6 mm (1/16 inch) thick, and full face or self-centering flat ring type. Bolts shall be squarehead conforming to ASME B18.2.1 and nuts shall be hexagon type conforming to ASME B18.2.2.

#### 2.3.2 Omitted

#### 2.3.3 Omitted

#### 2.3.4 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b and of the type suitable for the application, construction, and pipe type and sized involved.

#### 2.3.5 Valves

##### 2.3.5.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Bld Mat Dir or FM P7825a and FM P7825b.

#### 2.3.5.2 Check Valve

Check valve 50 mm (2 inches) and larger shall be listed in UL Bld Mat Dir or FM P7825a and FM P7825b. Check valves 100 mm (4 inches) and larger shall be of the swing type with flanged cast iron body and flanged inspection plates, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

#### 2.3.5.3 Hose Valve

Valve shall comply with UL 668 and shall have a minimum rating of 2070 kPa (300 psi). Valve shall be non-rising stem, all bronze, 90 degree angle type, with 65 mm (2-1/2 inch) American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Hose valve shall be provided with 65 to 40 mm (2-1/2 to 1-1/2 inch) reducer. Hose valves shall be equipped with lugged cap with drip drain, cap gasket and chain. Valve finish shall be polished brass.

#### 2.4 ALARM CHECK VALVE ASSEMBLY

Assembly shall include an alarm check valve, standard trim piping, pressure gauges, bypass, retarding chamber, testing valves, main drain, and other components as required for a fully operational system.

#### 2.5 WATER MOTOR ALARM ASSEMBLY

Assembly shall include a body housing, impeller or pelton wheel, drive shaft, striker assembly, gong, wall plate and related components necessary for complete operation. Minimum 20 mm (3/4 inch) galvanized piping shall be provided between the housing and the alarm check valve. Drain piping from the body housing shall be minimum 25 mm (1 inch) galvanized and shall be arranged to drain to the outside of the building. Piping shall be galvanized both on the inside and outside surfaces.

#### 2.6 ALARM INITIATING AND SUPERVISORY DEVICES

##### 2.6.1 Sprinkler Waterflow Indicator Switch, Vane Type

Switch shall be vane type with a pipe saddle and cast aluminum housing. The electro-mechanical device shall include a flexible, low-density polyethylene paddle conforming to the inside diameter of the fire protection pipe. The device shall sense water movements and be capable of detecting a sustained flow of 38 L/min (10 gpm) or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall include two SPDT (Form C) contacts, and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover and gasket to seal the mechanism from dirt and moisture.

##### 2.6.2 Omitted

##### 2.6.3 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

#### 2.7 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting or flush type as indicated on the drawings with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 65 mm (2-1/2 inch) diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

## 2.8 WALL HYDRANT

Wall hydrant shall be projecting or flush type as indicated on the drawings with cast body, matching wall escutcheon lettered "wall hydrant" with a polished brass finish. The connection shall have two male outlets with caps and chains. Male outlets shall have 65 mm (2-1/2 inch) diameter American Fire Hose Connection Screw Threads (NH) per NFPA 1963.

## 2.9 SPRINKLERS

Sprinklers shall be used in accordance with their listed spacing limitations. Temperature classification shall be ordinary. Intermediate temperature classification shall be provided where indicated on drawings. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Sprinklers with internal O-rings shall not be used.

### 2.9.1 Upright Sprinkler

Upright sprinkler shall be brass and shall have a nominal 12.7 mm (1/2 inch) orifice. Quick response type shall be provided in areas with light hazard classification.

### 2.9.2 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, recessed type with nominal 12.7 mm (1/2 inch) orifice. Pendent sprinklers shall have a polished chrome finish. Quick response type shall be provided in areas with light hazard classification.

### 2.9.3 Sidewall Sprinkler

Sidewall sprinkler shall have a nominal 12.7 mm (1/2 inch) orifice. Sidewall sprinkler shall have a polished chrome finish. Sidewall sprinkler shall be the quick-response type.

### 2.9.4 Omitted

### 2.9.5 Omitted

### 2.9.6 Dry Sprinkler Assembly

Dry sprinkler assembly shall be of the pendent type as indicated. Assembly shall include an integral escutcheon. Maximum length shall not exceed maximum indicated in UL Fire Prot Dir. Sprinklers shall have a polished chrome finish.

## 2.10 DISINFECTING MATERIALS

### 2.10.1 Liquid Chlorine

Liquid chlorine shall conform to AWWA B301.

### 2.10.2 Hypochlorites

Calcium hypochlorite and sodium hypochlorite shall conform to AWWA B300.

## 2.11 ACCESSORIES

### 2.11.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

### 2.11.2 Pendent Sprinkler Escutcheon

Escutcheon shall be one-piece metallic type with a depth of less than 20 mm and suitable for installation on pendent sprinklers. The escutcheon shall have a factory finish that matches the pendent sprinkler heads.

### 2.11.3 Pipe Escutcheon

Escutcheon shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

### 2.11.4 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located as indicated.

### 2.11.5 Identification Sign

Valve identification sign shall be minimum 150 mm wide x 50 mm high with enamel baked finish on minimum 1.214 mm (18 gauge) steel or 0.6 mm (0.024 inch) aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

## 2.12 OMITTED

## 2.13 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 1034 kPa (150 psi). The maximum pressure loss shall be 40 kPa at a flow rate equal to the sprinkler water demand, at the location of the assembly.

## PART 3 EXECUTION

### 3.1 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of NFPA 13, NFPA 24 and publications referenced therein. Installation of in-rack sprinklers shall comply with applicable provisions of NFPA 231C.

### 3.2 ABOVEGROUND PIPING INSTALLATION

Piping shall be run straight and bear evenly on hangers and supports.

#### 3.2.1 Protection of Piping Against Earthquake Damage

The system piping shall be protected against damage from earthquakes. Seismic protection shall include flexible couplings, sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required by NFPA 13 for protection of piping against damage from earthquakes. Branch lines shall be equipped with sway braces at the end sprinkler head and at intervals not exceeding 9 m

#### 3.2.2 Piping in Exposed Areas

Exposed piping shall be installed so as not to diminish exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

#### 3.2.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

#### 3.2.4 Pendent Sprinklers

Drop nipples to pendent sprinklers shall consist of minimum 25 mm (1 inch) pipe with a reducing coupling into which the sprinkler shall be threaded. Hangers shall be provided on arm-overs to drop nipples supplying pendent sprinklers when the arm-over exceeds 300 mm. Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 25 mm below the underside of the ceiling. On pendent sprinklers installed below suspended or dropped ceilings, the distance from the sprinkler deflector to the underside of the ceiling shall not exceed 100 mm. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area.

##### 3.2.4.1 Pendent Sprinkler Locations

Pendent sprinklers in suspended ceilings shall be a minimum of 150 mm from ceiling grid.

#### 3.2.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 750 mm in length shall be individually supported.

#### 3.2.6 Pipe Joints



Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site.

Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings and fittings shall be from the same manufacturer.

#### 3.2.7 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 15 mm (1/2 inch).

#### 3.2.8 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes pass through fire walls, fire partitions, or floors, a fire seal shall be placed between the pipe and sleeve in accordance with Section 07840 FIRESTOPPING. In penetrations which are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement which will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

#### 3.2.9 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

#### 3.2.10 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 25 mm (1 inch) pipe connected to the remote branch line; a test valve located approximately 2 meters above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.

#### 3.2.11 Drains

Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13 except that drain valves shall be used where drain plugs are otherwise permitted. Where branch lines terminate at low points and form trapped sections, such branch lines shall be manifolded to a common drain line.

#### 3.2.12 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 900 mm above finished grade. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

#### 3.2.13 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

### 3.3 UNDERGROUND PIPING INSTALLATION

The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 900 mm. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 150 mm above the finished floor.

A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor. In addition, joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 1500 mm outside the building walls shall meet the requirements of Section 02510 WATER DISTRIBUTION SYSTEM.

### 3.4 EARTHWORK

Earthwork shall be performed in accordance with applicable provisions of Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

### 3.5 ELECTRICAL WORK

Alarm signal wiring connected to the building fire alarm control system shall be in accordance with Section 13851 FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE. Wiring color code shall remain uniform throughout the system.

### 3.6 DISINFECTION

After all system components are installed and hydrostatic test are successfully completed, each portion of the sprinkler system to be disinfected shall be thoroughly flushed with potable water until all entrained dirt and other foreign materials have been removed before introducing chlorinating material. Flushing shall be conducted by removing the flushing fitting of the cross mains and of the grid branch lines, and then back-flushing through the sprinkler main drains. The chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA M20. The chlorinating material

shall be fed into the sprinkler piping at a constant rate of 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or liquid chlorine injected into the system through a solution-fed chlorinator and booster pump shall be used. Chlorination application shall continue until the entire system is filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system shall be opened and closed several times to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall then be flushed with clean water until the residual chlorine is reduced to less than one part per million. Samples of water in properly disinfected containers for bacterial examination will be taken from several system locations which are approved by the Contracting Officer. Samples shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA EWW. The testing method shall be either the multiple-tube fermentation technique or the membrane-filter technique. The disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

### 3.7 FIELD PAINTING AND FINISHING

Field painting and finishing are specified in Section 09900 PAINTING, GENERAL.

### 3.8 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, the Contractor shall complete certificates as specified in paragraph SUBMITTALS.

#### 3.8.1 Underground Piping

##### 3.8.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than the calculated maximum water demand rate of the system.

##### 3.8.1.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 1.89 liters (2 quarts) per hour per 100 gaskets or joints, regardless of pipe diameter.

#### 3.8.2 Aboveground Piping

##### 3.8.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 1400 kPa or 350 kPa in excess of maximum system

operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

### 3.8.3 Testing of Alarm Devices

Each alarm switch shall be tested by flowing water through the inspector's test connection. Each water-operated alarm devices shall be tested to verify proper operation.

### 3.8.4 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

## 3.9 FINAL ACCEPTANCE TEST

A technician employed by the installing Contractor shall be present for the final tests and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. In addition, the representative shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received.

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03/98

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CEGS-13965 (March 1998)

## SECTION 13965

WET CHEMICAL FIRE EXTINGUISHING SYSTEM  
03/98

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825a (1998) Approval Guide Fire Protection

FM P7825b (1998) Approval Guide Electrical Equipment

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 17A (1994) Wet Chemical Extinguishing Systems

NFPA 96 (1994) Ventilation Control and Fire  
Protection of Commercial Cooking Equipment

## UNDERWRITERS LABORATORIES (UL)

UL Fire Prot Dir (1997) Fire Protection Equipment Directory

## 1.2 GENERAL REQUIREMENTS

## 1.2.1 System Description

Each of the kitchen equipment items located under the hood, including the exhaust hood, grease filter, and exhaust duct serving the item shall be protected by preengineered wet chemical fire extinguishing system. System shall be installed with all accessories necessary for system to operate in accordance with manufacturer's instructions and as specified herein.

## 1.2.2 Regulatory Requirements

System application, design, and installation shall comply with NFPA 17A and NFPA 96, except as follows:

- a. Compliance shall include conformance to the advisory provisions by changing "should" to "shall."
- b. System components shall be listed in UL Fire Prot Dir or approved by FM P7825a and FM P7825b for use with wet chemical fire extinguishing systems.
- c. Reference to the "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

- d. The use of grease extractors does not eliminate the requirement that duct systems, grease removal devices, and hoods be protected by the wet chemical extinguishing system.

#### 1.2.3 Installation Drawings

Installation drawings shall be prepared by a representative of the manufacturer to ensure compliance with the requirements listed herein and with all manufacturer's requirements and recommendations.

#### 1.2.4 Installation Technician

The installation technician shall have been trained by the system manufacturer for system installation, operation, and maintenance.

### 1.3 COORDINATION OF TRADES

Each system shall be coordinated with the equipment, hood, and exhaust ducts that it protects along with other construction in order to eliminate any interference.

### 1.4 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

### 1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Wet Chemical Fire Extinguishing System; GA|D.

Manufacturer's catalog data including detail drawings for the following items. The data shall be highlighted to show model, size, options, etc., that are intended for consideration and shall be adequate to demonstrate compliance with contract requirements.

- a. Storage containers and mounting brackets
- b. Fusible links, cables, conduit, corner pulleys, and link mounting frames/brackets
- c. Release mechanisms
- d. Valves
- e. Discharge nozzles
- f. Piping components
- g. Remote manual actuation stations
- h. Fuel and power shutoff

- i. Alarms, alarm devices, alarm interface(s), control panels

#### SD-04 Drawings

Wet Chemical Fire Extinguishing System; GA|D.

Drawings consisting of system layout including assembly and installation details and electrical connection diagrams; piping layout showing pipe sizes, lengths, and supports. Drawings shall include any information required to demonstrate that the system has been coordinated and will function as intended and shall show system relationship to items it protects and clearances required for operation and maintenance. Drawings shall also include conduit, cables, manual actuation stations and fusible links.

#### SD-06 Instructions

Preliminary Tests; GA|F.

Proposed test procedures for preliminary test, at least 2 weeks before the start of related testing.

Final Acceptance Tests; GA|F.

Proposed test procedures for final acceptance test, at least 2 weeks before the start of related testing.

System Diagrams; GA|F.

Proposed diagrams, at least 2 weeks before the start of preliminary tests. System diagrams that show system layout and typed condensed normal and emergency operating procedures, methods for checking the system for normal, safe operation, and procedures for manual actuation shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

#### SD-07 Schedules

Test Schedule; GA|F.

Proposed test schedule for acceptance test, at least 2 weeks before the start of related testing.

Field Training; GA|F.

Proposed schedule for field training, at least 2 weeks before the start of related training.

#### SD-08 Statements

Similar Services; GA|F.

Statement demonstrating successful completion of similar services on at least five projects of similar size and scope, at least 2 weeks before submittal of other items required by this section.

#### SD-09 Reports



#### Preliminary Tests; GA|F.

Test report for the preliminary tests in booklet form, upon completion of testing. Report shall document test results including repairs and adjustments made, and final test results.

#### Final Acceptance Tests; GA|F.

Test report for the final acceptance tests in booklet form, upon completion of testing. Report shall document test results including repairs and adjustments made, and final test results. The weight of each storage container shall be recorded before final acceptance test and after test has been completed and containers recharged.

#### SD-13 Certificates

##### Installation Technician; GA|F.

Concurrent with statement of similar services, manufacturer's certification of installation technician.

##### Installation Drawings; GA|F.

Concurrent with installation drawings, manufacturer's certification of installation drawings.

#### SD-19 Operation and Maintenance Manuals

##### Wet Chemical Fire Extinguishing System; FIO.

Six manuals listing step-by-step procedures required for system actuation (automatic and manual), recharging, and routine maintenance, at least 2 weeks before field training. The manuals shall include the manufacturer's name, model number, parts list, list of tools and parts that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and control diagrams, troubleshooting guide, and recommended service organization (including address and telephone number). Service organization shall be capable of providing 4 hour onsite response to a service call on an emergency basis.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

System components shall be the standard products of a manufacturer regularly engaged in the manufacturing of products that are of similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years before bid opening. The 2-year experience shall include installations of systems under similar circumstances and of similar size. Systems shall be supported by a service organization.

### 2.2 PIPING COMPONENTS

#### 2.2.1 Pipe and Fittings

Pipe and fittings shall be Schedule 40 stainless steel. Stainless steel tubing may be used in accordance with manufacturer's recommendations. Galvanized pipe shall not be used.

### 2.2.2 Nozzles

Nozzles shall be stainless steel and shall be equipped with an integral strainer to prevent matter inside the distribution piping from clogging the nozzle orifice. Each nozzle orifice shall be provided with a seal to protect the nozzle from clogging by grease or other obstructions. This seal shall detach upon actuation.

### 2.3 SYSTEM CONTROLS

Each system shall be actuated by fusible link and by a remote manual actuation station connected to the extinguishing system release mechanism by cable. Remote manual actuation stations shall be located along the path of egress and shall automatically actuate the building and base fire alarm system. The system controls shall automatically shut off fuel flow and electrical power to the protected appliances and other appliances located under the ventilating system protected by the extinguishing system upon system actuation. All cables used shall be stainless steel with corner pulleys employing stainless steel ball bearings at all corners. All cable and wiring shall be enclosed in conduit.

### 2.4 OMITTED

### 2.5 WET CHEMICAL

The wet chemical shall not have an adverse effect on stainless steel during exposure periods of up to 24 hours.

### 2.6 IDENTIFICATION SIGNS

Identification signs shall be located at each remote manual actuation station. Signs shall be fabricated of rigid plastic, red in color, with engraved white letters that are a minimum 6.5 mm in height. Each sign shall be engraved with "Fire Extinguishing System" and with a brief description of the equipment protected.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Installation shall be performed by the installation technician in accordance with system manufacturer's instructions. Ductwork access doors shall be provided where indicated and at any items requiring service and inspection, including nozzles and fusible links. Ductwork access doors shall be in accordance with Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

### 3.2 PRELIMINARY TESTS

After installation has been completed, each system shall be actuated by both fusible link and by remote actuation station to demonstrate proper function of all components, including alarms and fuel flow and power shut off. Actuation by fusible link shall be in a manner approved by the system manufacturer. Test containers, pressurized with either nitrogen or air to normal system operating pressure and of the same size as actual operating containers shall be discharged into system. The seals shall release as during normal actuation. After each discharge, the nozzles shall be removed, disassembled, and strainers shall be cleaned. System piping shall

be inspected and cleaned as necessary. All functions of system operation shall be verified, including switches, shutdown of fuel and power to appliances protected by the system or served by the same ventilation system, uniform delivery of air or nitrogen, and activation of alarms. Nozzle seals/covers shall be replaced after the preliminary tests are complete. In the event portions of the tests are unsuccessful, repairs shall be made and the entire test repeated until successful.

### 3.3 FINAL ACCEPTANCE TESTS

System shall be actuated by both fusible link and remote manual actuation station and all system functions shall be verified as described in Paragraph PRELIMINARY TESTS using test containers specified for preliminary tests. Each nozzle shall be provided with a plastic container, hose, and hose fitting to capture all wet chemical discharged. All tests or checks recommended by the manufacturer shall also be performed. In the event portions of the tests are unsuccessful, repairs shall be made and the entire test repeated until successful. Nozzle seals/covers shall be replaced after the final acceptance tests are complete. The system shall be returned to normal operating condition after the completion of testing and wet chemical containers expended shall be recharged and verified leak tight. Extinguishing system and equipment and duct protected by the extinguishing shall be cleaned after completion of testing. Any damage shall be repaired by the Contractor. The weight of each storage container shall be recorded before final acceptance test and after test has been completed and containers recharged.

### 3.4 FIELD TRAINING

The Contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 4 hours of normal working time and shall start after the system is functionally complete but prior to the final acceptance test. The field instruction shall cover all of the items contained in the approved Operation and Maintenance Instructions.

-- End of Section --

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CEGS-14240 (October 1993)

## SECTION 14240

ELEVATORS, HYDRAULIC  
10/93

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1997) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 106	(1997a) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 176	(1996) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM A 366/A 366M	(1996) Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
ASTM A 568/A 568M	(1997) Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A 569/A 569M	(1997) Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
ASTM D 92	(1996) Flash and Fire Points by Cleveland Open Cup ( IP 36/84 (89))
ASTM E 84	(1996a) Surface Burning Characteristics of Building Materials

## ASME INTERNATIONAL (ASME)

ASME A17.1	(1996) Safety Code for Elevators and Escalators
ASME A17.2.2	(1994) Inspectors' Manual for Hydraulic Elevators
ASME B16.11	(1991) Forged Fittings, Socket-Welding and Threaded
ASME B31.1	(1995; B31.1a; B31.1b; B31c) Power Piping
ASME QEI-1	(1993; QEI-1a 1995) Standard for the

## Qualification of Elevator Inspectors

## CODE OF FEDERAL REGULATIONS (CFR)

36 CFR 1191 Americans with Disabilities Act (ADA)  
Accessibility Guidelines for Buildings and  
Facilities

## FEDERAL STANDARDS (FED-STD)

FED-STD 795 (Basic) Uniform Federal Accessibility  
Standards

## INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO Bldg Code (1997) Uniform Building Code (3 Vol.)

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (1995) High-Pressure Decorative Laminates

NEMA MG 1 (1993; Rev 1; Rev 2; Rev 3) Motors and  
Generators

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

NFPA 252 (1995) Fire Tests of Door Assemblies

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation. Submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-01 Data

Training Data; FIO.

Information describing the training course for operating personnel, training aids and samples of materials to be used, training schedules, and notification of training.

Elevator System; FIO.

A complete list of equipment and material, including illustrations, schedules, manufacturer's descriptive data and technical literature, performance charts, catalog cuts, installation instructions, brochures, diagrams, and other information required for fabrication and installation of the equipment. Data shall include calculations for reaction loads imposed on building by elevator systems and to demonstrate that the proposed elevator system meets requirements for seismic loading of zone 1 in accordance with ICBO Bldg Code. Certified copies of list reports may be submitted in lieu of calculations. Calculations to demonstrate compliance with ASME A17.1, Rule XXIV shall be included. Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than 4 weeks prior to date of beneficial



occupancy. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended to be replaced and replacement interval required. Data shall include appropriate sizing of electrical protective devices.

#### SD-04 Drawings

Elevator System; FIO.

Detail drawings including dimensioned layouts in plan and elevation showing the arrangement of elevator equipment, anchorage of equipment, clearances for maintenance and operation; and details on hoistway, doors and frames, operation and signal stations, controllers, motors, guide rails and brackets, cylinder and plunge unit, and points of interface with normal power fire alarm system and HVAC or exhaust systems. Drawings shall show any revised building electrical system required to make supplied elevator system function as specified. Drawings shall contain complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operation and functions of system devices. Drawings shall include the appropriate sizing of electrical protective devices which are frequently different from National Electrical Code standard sizes.

#### SD-06 Instructions

Framed Instructions; FIO.

Diagrams, instructions, and other sheets proposed for posting.

#### SD-08 Statements

Qualification Certificates; FIO.

Certificates of experience of elevator mechanics employed to install, supervise and test the elevator shall certify mechanics to have not less than 5 years experience installing, supervising and testing elevators of the type and rating specified. Certificate shall certify that elevator system installer is acceptable to elevator manufacturer prior to installation of elevators.

#### SD-09 Reports

Testing; FIO.

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of installed system.

#### SD-14 Samples

Finishes; FIO.

Samples of materials and products requiring color or finish selection.

#### SD-18 Records

Test Procedures; GA|F

A plan detailing the testing procedures shall be submitted 60 days prior to performing the elevator tests.

#### SD-19 Operation and Maintenance Manuals

Elevator System; GA|F.

Six copies of operation manual outlining the step-by-step procedures for system startup, operation and shutdown. Manuals shall include manufacturer's name, model number, service manual, parts list and brief description of all equipment, including basic operating features. Six copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Manuals shall include equipment layout and complete wiring and control diagrams of the system as installed. Operation and maintenance manuals shall be approved prior to training course.

### 1.3 QUALIFICATIONS

Hydraulic elevators shall be pre-engineered elevator systems, and provided by a company regularly engaged in the manufacture of elevator systems. The manufacturer shall either install the elevator system or provide letter of endorsement certifying that the elevator-system installer is acceptable to the manufacturer.

### 1.4 REGULATORY REQUIREMENTS

Design and fabrication shall be in accordance with ASME A17.1. Each car shall have the capacity to lift a live load, exclusive of the car, at a speed as specified in the following schedule. The approximate travel, terminal floors, number of stops and openings, and the car sizes shall be as shown in the schedule. The elevators shall serve the floors with stops and openings in accordance with the requirements indicated. Elevators shall provide accessibility and usability for physically handicapped in accordance with the requirements for the handicapped in FED-STD 795 and 36 CFR 1191.

#### 1.4.1 Elevator Schedule (Passenger)

Number of Elevators Required:	1
Service:	Passenger
Capacity:	907 kg (2000 pounds)
Speed:	0.41 m/s (80 fpm) (full load up) (0.41 m/s (80 fpm) downspeed)
Platform Size:	1829 wide by 1524 deep
Net Travel:	4000 mm
Landings:	2
Openings: Front	1
Entrance Type:	Single-speed, horizontal-sliding

## 1.5 DESIGNATED LANDING

For the purposes of firefighter's service and emergency operations, as required by Section 211, ASME A17.1, the designated landing or level shall be the first floor.

## 1.6 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, excessive humidity and excessive temperature variations; and dirt, or other contaminants.

## 1.7 FIELD MEASUREMENTS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field and advise the Contracting Officer of any discrepancy before performing any work.

## 1.8 WARRANTY

Warranty service shall be provided for each elevator for a period of 12 months after date of acceptance by Contracting Officer. Warranty service shall be performed only by trained elevator mechanics during regular working hours and shall include manufacturer's warranty requirements including but not limited to adjusting, lubricating and cleaning of equipment and furnishing supplies and parts to keep elevator in operation, except such parts made necessary by misuse, accident or negligence not caused by the Contractor. Testing and adjustments shall be in accordance with the applicable provisions of ASME A17.1 and ASME A17.2.2. Emergency callback service shall be included and available 24 hours a day, 7 days per week, with an initial telephone response time of 1 hour and a response time of 4 hours for a mechanic to the site. Inspection and service for fire service operation and seismic requirements shall be performed every 6 months. Documentation of inspection and testing, and certification of successful operation shall be provided with each unit.

# PART 2 PRODUCTS

## 2.1 GENERAL EQUIPMENT REQUIREMENTS

### 2.1.1 Standard Products

Material and equipment shall be the standard products of manufacturers regularly engaged in the fabrication of elevators and/or elevator parts, and shall essentially duplicate items which have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is available 24 hours a day, 7 days per week, with a response time of 4 hours.

### 2.1.2 Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, and electrical and mechanical characteristics on a plate secured to the item of equipment.

### 2.1.3 Special Tools

One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of the equipment shall be provided.

#### 2.1.4 Electrical Work

Changes to the electrical distribution system required for coordination with elevator equipment shall be performed and coordinated by Contractor, at Contractor's expense. Electrical service for elevator machines shall be 208 volt, 60-Hertz, 3-phase, 4 wire solid neutral grounded alternating current. Electric service for elevator car lighting shall be 120-volt, single-phase, 60-Hertz grounded service. Electrical work shall conform to requirements in Section 16415 ELECTRICAL WORK, INTERIOR. A disconnect switch that will shut off power to the elevator car lighting shall be provided in the elevator machine room adjacent to the elevator control panel. A telephone junction box and an elevator car lighting junction box shall be provided adjacent to each controller. A single-phase electric circuit with grounded connection for video monitor shall be provided in machine room.

#### 2.1.5 Use of Asbestos Products

Materials and products required for manufacturing and installing elevators shall not contain asbestos.

### 2.2 MISCELLANEOUS MATERIALS

#### 2.2.1 Materials for Car Enclosures

Materials for car enclosures shall meet flame spread rating 0 to 75 and smoke development 0 to 450 as tested in accordance with requirements of ASTM E 84 as established by ASME A17.1, Rule 204.2.

#### 2.2.2 Structural Steel

Structural steel shall be hot-rolled commercial quality carbon steel, pickled, oiled, complying with ASTM A 569/A 569M and ASTM A 568/A 568M.

#### 2.2.3 Cold-Rolled Sheet Steel

Sheet steel shall be cold-rolled commercial quality low carbon steel, Class 1, exposed matte finish, oiled, complying with ASTM A 366/A 366M and ASTM A 568/A 568M.

#### 2.2.4 Stainless Steel

Stainless steel shall be ASTM A 176 Type 302/304, austenitic, corrosion-resistant, with grain of belting in the direction of longest dimension. Surfaces shall be smooth and without waves and shall be in compliance with ASTM A 366/A 366M.

### 2.3 PASSENGER ELEVATOR CAR

#### 2.3.1 Car Fronts

Fronts for passenger elevators shall be combination door post and return panels manufactured of 1.9837 mm thick (14 gauge) stainless steel provided with necessary cutouts for operating devices. Car operating panel shall be recessed into front return panel with surface-applied operating panel cover. Position indicator in front return shall be recessed with a surface-applied cover plate. Exposed stainless steel shall be finished with No. 4 Satin Finish, unless otherwise specified.

### 2.3.2 Car Doors

Car doors for passenger elevators shall be constructed from 1.519 mm thick (16 gauge) sheet steel and stainless steel cladding. Each door shall be sound-deadened and reinforced to receive required operating mechanism and hardware, and have two removable door guides per panel. Seams, screws or binding strips shall not be visible from within the car. Threshold shall be extruded aluminum with grooves for door guides. Exposed stainless steel shall be finished with No. 4 Satin Finish, unless otherwise specified. Car doors shall be equipped with a proximity-type infrared protective device having the following operation:

- a. When doors are in full-open position, doors shall be unable to initiate closing if a person comes within detection zone. Detection zone moves with doors, so that if a passenger or object enters the zone after doors have begun to close, doors shall stop, then reverse to reopen. Doors shall reclose after a brief time. A passenger entering or leaving cars shall not cause doors to reopen unless doors reach a predetermined proximity to passenger.
- b. After a stop is made, doors shall remain open for a time to permit passenger transfer, after which doors shall close automatically. This time interval shall be less for a car call than for a hall call or a coincident car/hall call.
- c. If there is either a hall call anywhere in the group or a car call in the car in question and doors are prevented from closing for a fixed time period, door protective device shall be rendered inoperative, a buzzer shall sound in car and doors shall close at approximately half speed. Normal door operation shall resume at next landing reached by car.

### 2.3.3 Car Platform

Car platform for passenger elevators shall be fabricated from steel plates secured to a steel frame or plywood secured to a steel frame. Steel car platforms shall be assembled into a one-piece platform with top and bottom steel plates welded to structural steel frame and covered with felt and sound-isolation. Plywood car platform shall be 18 mm (3/4 inch) thick Exposure 1 plywood secured to underside of structural steel frame with metal fire protection secured to underside of structural steel frame.

### 2.3.4 Sling

Sling for passenger elevators shall be constructed of heavy steel stiles properly affixed to a steel crosshead and bolster with adequate bracing members to remove all strain from car enclosure. Steel bumpers shall be furnished for fastening sling to plunger.

### 2.3.5 Walls

Walls for passenger elevators shall be 2426 mm (7 feet 11-1/2 inches) high from floor to the underside of lighting fixtures. Side and rear panels shall be 1.519 mm thick (16 gauge) sheet steel panels. Side and rear removable panels shall be applied to car walls and shall be manufactured from 18 mm (3/4 inch) plywood or composition board finished on front, back and edges faced with plastic laminate conforming to NEMA LD 3, general purpose type. Panels shall be mounted on car walls in a manner permitting

their reversing. Panels shall be evenly spaced with not less than two panels on each side and three panels at rear with reveal standard with manufacturer. Vent around base shall be concealed behind removable panels. Plastic laminate color shall be as specified in Section 09000 BUILDING COLOR AND FINISH SCHEDULE.

#### 2.3.6 Car Top, Ceiling and Light Fixtures

Car top for passenger elevators shall be manufactured from 2.657 mm thick (12 gauge) sheet steel and shall be not less than 140 mm high with drop-ceiling and light fixtures. Ceiling shall be 3 mm (1/8 inch) thick translucent white plastic fire-retardant light diffuser supported by baked-enamel perimeter frame and dividers to form drop-ceiling light fixture. Light fixtures shall be fluorescent type flush with car ceiling, manufactured of sheet steel with flange and enclosed sides and top, baked-enamel reflector, mounted directly to outlet box. Bottom of fixtures shall be flush with car ceiling. Fluorescent light fixtures shall be dual lamp with quick-starting high-power factor, Class P ballasts with safety lamp guard clamps on fluorescent tubes. Light level shall average at least 108 lx (10 footcandles) measured at the car threshold, with the door closed. A part of car light fixture shall be removable to permit use of the emergency exit panel in top of car.

#### 2.3.7 Emergency Exit

Car top for passenger elevators shall be manufactured with a hinged emergency exit panel of 2.657 mm thick (12 gauge) steel which opens up to clear the crosshead and car door operator. Emergency exit panel shall be hinged on counterweight side and held in place with nonremovable fastening devices at each corner, and be openable from top of car only. A minimum of two sides of exit panel shall lap exit opening by 25 mm. Exits shall be equipped with electrical contacts which will prevent operation of car when the exit door is open and cause the alarm bell to ring.

#### 2.3.8 Floor Finish

Floor finish for passenger elevators shall be finished with porcelain paver tile, as specified in Section 09310 CERAMIC TILE. Tile shall be laid flush with the extruded aluminum platform threshold. Paver color shall be as specified in Section 09000 BUILDING COLOR AND FINISH SCHEDULE.

#### 2.3.9 Base

Base for passenger elevators shall be porcelain pavers, 150 mm (6 inches) high.

#### 2.3.10 Handrails

Handrails for passenger elevators shall be mounted on each wall and shall comply with ASME A17.1, FED-STD 795 and 36 CFR 1191.

#### 2.3.11 Exhaust Fan

Exhaust fan for passenger elevators shall be two-speed exhaust type ventilating unit mounted in car ceiling and shall be provided with a stainless steel grille. Units shall be suitably isolated from car ceiling and shall provide at top speed of a minimum of 6 air changes per hour for car volume and car occupancy. Switches for the operation of the exhaust unit shall be located in car station locked cabinet or key-switched.

### 2.3.12 Communications

A telephone system in stainless steel cabinets shall be provided for passenger elevators. A vandal-resistant speaker type intercom with push-buttons to activate shall be installed in car station behind a stainless steel perforated grille and connected to a programmable auto-dialer located in machine room. Auto-dialer shall be provided with a solid-state charger unit which will automatically provide emergency power and an immediate transfer in the event of failure of normal power supply. The push-button located in car station or in separate cabinet shall be at the prescribed handicapped height and shall be identified as "EMERGENCY PHONE PUSH TO ACTIVATE". The entire communication assembly shall be approved for an elevator installation. The push button telephone shall comply with FED-STD 795 and 36 CFR 1191. The telephone communication shall not be terminated until one of the communicating parties hangs up the receiver or manually disconnects the communication link.

### 2.3.13 Car Emergency Lighting System

Emergency car lighting system for passenger elevators shall consist of an emergency power pack on top of the elevator and a remote lighting fixture inside elevator car located in or above car operating panel.

#### 2.3.13.1 Power Pack

Power pack for emergency lighting system shall be a sealed lead-cadmium or nickel-cadmium 6-volt rechargeable batteries with solid-state controls and an integral regulating charger connected to normal power supply. Power pack unit shall contain the following:

- a. Minimum 150 mm (6 inch) diameter alarm bell connected to the elevator alarm and emergency push-button.
- b. Top of car light fixture with protective wire guard.
- c. Testing circuit and pilot light.
- d. Low-wattage pilot light indicator.
- e. Battery low-voltage disconnect.

#### 2.3.13.2 Emergency Light Fixture

Emergency light fixture shall be located in car station inside elevator car, with flush-mounted lens and shall consist of the following:

- a. A minimum of two lamps capable of providing a minimum level of illumination of 10.8 lx (1.0 footcandle) at a point 1220 mm (4 feet) above the floor, 300 mm (1 foot) in front of car station.
- b. Steel fixture frame with white baked-enamel finish.
- c. Frosted acrylic lens, 6 mm (1/4 inch).

#### 2.3.13.3 Remote Light Fixture

Upon interruption of normal power, remote light fixture for passenger elevators shall automatically and immediately illuminate and permit

operation of alarm bell, subject to activation of emergency stop-switch or alarm button. Emergency power pack shall be capable of providing a minimum of 1 hour emergency bell operation and 4 hours of continuous illumination.

#### 2.3.14 Protection Pads

Car shall be provided with wall protection pads with inconspicuous stainless steel pad hooks spaced not over 460 mm apart near the ceiling. Pads shall be heavy-quality fire-retardant treated canvas with two layers of sewn cotton batting with metal eyelets for each pad hook. Pads shall cover entire wall surface except operating devices.

#### 2.3.15 Certificate Frame

A stainless steel certificate frame with translucent plexiglass lens of the appropriate size to receive certificate issued by inspecting agency shall be provided. Frame shall be engraved to show name of manufacturer, carrying capacity in kilograms (pounds) and maximum number of persons allowed.

#### 2.3.16 Car Guide Shoes

Guide shoes for passenger elevators shall be the adjustable mounting type on each side of car. Shoes shall be rigidly secured in accurate alignment at top and bottom of car frame. Flexible type sliding guide shoes shall consist of a swivel-type shoe, assembled on a metal base with provisions for self-alignment. Each shoe shall be provided with renewable gibs. Car guide shoes shall be adjustable for side play between guide rails. Renewable wearing gibs shall be fabricated from a durable plastic compound material having a low coefficient of friction and long wearing qualities. Gibs shall be the type requiring minimum rail lubrication.

### 2.4 PASSENGER ELEVATOR HOISTWAY ENTRANCES

#### 2.4.1 Hoistway Doors

Hoistway doors for passenger elevators shall be designed and fabricated as part of a Class B 1-1/2 Hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory. Doors for passenger elevators shall be hollow metal type with plain panel design not less than 32 mm (1-1/4 inches) thick with 1.519 mm thick (16 gauge) face sheet-steel panels, and stainless steel cladding, with 1.519 mm thick (16 gauge) sight guards to match door finish. Each door shall be reinforced with continuous vertical members and filled with sound-deadening material. Doors shall be reinforced to accept the required operating mechanism and hardware. Doors shall have two removable door guides per panel. Seams, binding strips or screws shall not be visible from the landing. [xposed steel shall be finished with rust-inhibitive primer and baked-enamel in a color to be selected, unless otherwise specified.

#### 2.4.2 Hoistway Frames

Hoistway frames for passenger elevators shall be designed and fabricated as part of a Class B 1-1/2 Hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory. Frames shall be formed 1.897 mm thick (14 gauge) sheet-steel [with stainless steel cladding] with head and jamb in flush alignment and corners welded and ground smooth. Head and jamb section shall be bolted



assembly with bolts, washer and locking nut or lock washer. Frame assembly shall be securely fastened to the structure. Frames shall return to the wall. Combination buck and jamb frames may be provided with knockdown back flanges to permit installation in concrete walls. Exposed steel shall be finished with rust-inhibitive primer and baked-enamel in a color to be selected, unless otherwise specified.

#### 2.4.3 Symbols

Raised stainless steel symbols as required by FED-STD 795 and 36 CFR 1191 of color selected, shall be provided at each floor to indicate the floor location. Symbols shall be attached with concealed fasteners. Symbols shall be placed in a location which can be seen by passenger from the opened passenger elevator doors.

#### 2.4.4 Sills

Sills for passenger elevators shall be extruded aluminum with slip-resistant surface and machined grooves for door guides, secured to floor beams.

#### 2.4.5 Strut Angles

Strut angles for passenger elevators shall be structural steel of size not less than 76 x 76 x 5 mm (3 x 3 x 3/16 inch) extending from sill to beam above and anchored to building structure with structural steel fastenings and bracings of structural members with a cross section of not less than strut angles.

#### 2.4.6 Door Hangers and Housing

Each door panel shall be provided with not less than two sheave-type hangers designed for required door operation. Hanger housing and support shall be fabricated from formed Z-shaped steel angles of size not less than 5 mm (3/16 inch) thick bolted to strut angles.

#### 2.4.7 Door Rollers

Door rollers shall be constructed with grease-packed ball-bearings and shall be tired with a sound-reducing material. Diameter of rollers shall not be less than 83 mm (3-1/4 inches) for car doors and not less than 57 mm (2-1/4 inches) for hoistway doors. Upward thrust shall be taken by a hardened and ground ball-bearing roller assembled on an eccentric stud to provide adjustment.

#### 2.4.8 Hanger Track

Hanger track shall be of high carbon cold-drawn steel, round at top to receive door rollers, round at bottom to receive up-thrust rollers, of size engineered to accommodate load requirements.

#### 2.4.9 Covers and Guards

Hanger covers, dust covers, toe guards and fascia plate shall be fabricated from 1.519 mm thick (16 gauge) reinforced steel and finished with baked-enamel. Hanger covers shall extend the full door travel and shall be mounted in sections for ease of servicing door hangers. Dust covers shall be provided over top terminal landing door only and shall be secured to hanger housing and building structure. Toe guards shall be secured to

sill. Fascia plates shall be provided between each door hanger housing and sill.

## 2.5 PASSENGER ELEVATOR DOOR OPERATION

Car and hoistway doors for passenger elevators shall be operated simultaneously by an electric-power door operator. Doors shall operate smoothly in the opening direction and closing direction and be electrically or hydraulically cushioned to stop at both the full-open and full-closed position. Operators shall be high-speed heavy-duty type which will provide an average door-opening speed of 0.76 m/s (2-1/2 fps). Car and hoistway doors shall be opened and closed simultaneously in a maximum time of 2.6 seconds. When on automatic operation door-closing time shall not exceed 3.6 seconds and door-closing force shall not exceed 130 N (30 pounds). Reversal of doors when closing shall be accomplished by the "DOOR OPEN" button, car door safety edge, or interruption of the photoelectric light beams. Doors shall be arranged so that doors can be opened manually in the event of power failure.

## 2.6 PASSENGER ELEVATOR OPERATING AND SIGNAL FIXTURES

### 2.6.1 General

Elevator fixtures and panels for passenger elevators shall be constructed of 3 mm (1/8 inch) thick faceplates of stainless steel. Fastenings for all exposed fixtures shall be secured with tamper-proof spanner-head screws of same material and finish as fixture. Hall and car call-buttons shall be the call-register type with a low-voltage power supply not to exceed 48 volts. Pressure on a button shall illuminate button to indicate that a call in the desired direction has been registered. Car and hall fixtures shall be designed and located at the prescribed height to accommodate the handicapped in accordance with FED-STD 795 and 36 CFR 1191 for passenger elevators only. Handicapped markings shall be integral with faceplates in accordance with FED-STD 795 and 36 CFR 1191. Surface-applied markings are not acceptable. Engraving shall be black-filled except for fire-service identification which shall be red-filled. Operating and signal fixture contacts and lamps shall be completely enclosed in steel boxes finished with a baked-enamel. Boxes for hall landing devices shall be equipped for proper adjustment to wall. Lamps shall be installed in light-tight compartments. Replacement bulbs shall be readily available from three sources.

### 2.6.2 Car Operating Panel

Car operating panel for passenger elevators shall be provided with the necessary raised (0.8 mm (0.03 inch)) markings for the handicapped, and shall include a series of minimum 20 mm (3/4 inch) diameter or square push-buttons numbered to correspond to the floor served and various additional switches, buttons and light jewels, including emergency stop, alarm button, "DOOR OPEN" button and telephone. Operating buttons shall be of manufacturer's standard design. Buttons and switches not required for automatic or fire-service operation shall be key-operated and mounted on front-return car operating station. Elevator number and "NO SMOKING" shall be international symbol engraved on upper portion of car. Operating panel in car shall consist of a flush-mounted panel containing the following operating devices:

- a. "DOOR OPEN" button.

- b. "DOOR CLOSE" button.
- c. Key-operated car fan/light switch.
- d. Key-operated ventilating blower switch/call light.
- e. Communication telephone.
- f. Emergency stop-switch key-operated when operated will stop the car independently of normal stopping devices. Operation of emergency stop switch shall not cause any power variance or surge that may affect the operation or condition of the control panel or its components.
- g. Emergency signal-switch connected to a 150 mm (6 inch) diameter signal bell outside of elevator hoistway at first floor located as shown or as directed.
- i. Key-operated inspection switch which will render normal operation inoperative for the purpose of using the hoistway access switch.
- j. Key-operated fire-service switch and light jewel.

#### 2.6.3 Omitted

#### 2.6.4 Hall-Call Station

Hall-call operating devices for passenger elevators at landing shall consist of an "UP" push-button at bottom landing, a "DOWN" push-button at top landing, and "UP" and "DOWN" push-buttons at all other landings. Buttons shall be manufacturer's standard design. Buttons shall be designed with 0.8 mm (1/32 inch) operating clearance to seat on faceplate in lieu of button mechanism. Buttons shall have maximum protrusion of 5 mm (3/16 inch) beyond faceplate with beveled edges to prevent damage from side blows.

##### 2.6.4.1 Omitted

##### 2.6.4.2 Fire-Service Switch

Fire-service switch for passenger elevators shall be located at the designated landing.

#### 2.6.5 Direction Lanterns

Lanterns for passenger elevators shall be in accordance with FED-STD 795 and 36 CFR 1191 and shall be provided at all floor landings and in each car entrance column. Lanterns shall be the manufacturer's standard design. Lanterns shall signal the approach of a stopping car when car is a predetermined distance from landing.

#### 2.6.6 In-Car Car-Position Indicator

Indicator numerals and directional arrows for passenger elevators shall be 25 mm (1 inch) high, white translucent plastic. As car travels through hoistway the car position shall be indicated by illumination of light jewel corresponding to landing at which the car is stopped or passing. Necessary light baffles shall be provided. Floor numerals and letters shall illuminate white. A position indicator of the digital-readout or dot-matrix type (minimum 50 mm (2 inch) high indication) shall be provided

in car transom panel. Number corresponding to car position shall remain illuminated when motor drive is shut down. Illumination shall be shrouded in an approved manner to protect against glare from car lighting.

#### 2.6.7 Audible Signals

An audible signal shall be provided at each floor landing and in each car and shall sound coincident with the lantern illumination indicators. The audible signal shall be no less than 20 decibels with a frequency no higher than 1500 Hz. The audible signal shall sound once for UP direction and twice for DOWN direction.

#### 2.6.8 Combination Hall-Position Indicator and Directional Arrows

Combination hall-position indicator and directional arrows for passenger elevators shall be provided at first floor landing directly above entrance frame. As elevator travels in hoistway, elevator position shall be indicated by illumination in alpha-numeric characters corresponding to the landing where elevator is stopped or passing. Number corresponding to position of car shall remain illuminated when motor is shut down. An audible signal shall sound in elevator car to indicate that the elevator is stopping or passing a floor served by elevator. Fixture design and operation shall be similar in design to that specified for Car Position Indicator.

#### 2.7 PASSENGER CAR OPERATION (TWO-STOP AUTOMATIC CAR OPERATION)

The operating device at each of two hoistway landings shall consist of a single illuminating push-button. The system shall be designed for operating elevator from push-buttons at landings and car buttons marked for corresponding landings. Pressure on a car button or landing button shall dispatch or call the car to other landings if interlock circuits have been established. A call shall remain registered if a lower floor landing button is pressed while car is making an UPWARD trip. After car has reached upper landing and interlock circuits have been reestablished the car shall automatically reverse and respond to lower landing call. Elevator shall operate similarly for DOWN direction of travel. A time-limit relay shall be provided to hold the car for a predetermined period at landing where car stops. When all calls are completed the elevator shall park at last floor served. A landing button pressed momentarily at same floor at which the car is parked shall automatically open car hoistway doors.

2.8 OMITTED

2.9 OMITTED

2.10 OMITTED

2.11 OMITTED

2.12 OMITTED

2.13 OMITTED

2.14 OMITTED

#### 2.15 AUTOMATIC EMERGENCY POWER OPERATION

Elevator control system shall be arranged to operate on emergency power supply upon failure of the normal power supply. Elevators operating on dedicated service, such as fire service, will not be required to return to designated landing when emergency power becomes available for respective elevator. Elevators shall operate as follows:

- a. When normal power supply fails, car shall shut down.
- b. Car shall automatically start and travel at full-rated speed to designated landing, stop, open the car and hoistway doors, then shut down.

## 2.16 AUTOMATIC ELEVATOR OPERATION

### 2.16.1 General

The operating device shall consist of a series of push-buttons in the car numbered to correspond to various landings, "UP" and "DOWN" buttons at intermediate landings and a single button at terminal landing. To meet the elevator operation requirements specified in this section all buttons shall be connected electrically to the control system which governs the floor selection, car selection, direction of travel and governs the acceleration and retardation.

### 2.16.2 Operation

Car calls shall be registered within the car by pressing the button corresponding to the designated floors. Hall calls shall be registered by pressing buttons in the corridor push-button fixture. Once the demand for elevator service has been established and the car has received a start signal the car operation shall be as follows.

#### 2.16.2.1 Door Closing

Doors shall close automatically. When doors are fully closed and the interlock circuit established, the car shall start to move in the direction established by control system. Car shall accelerate and decelerate automatically and stop at first floor for which a car button has been registered or at first floor for a corridor demand which has been assigned to car.

#### 2.16.2.2 Door Opening

Doors shall open automatically as car reaches the landing. After a predetermined time the doors shall close and the car shall proceed to answer the remaining car or assigned corridor calls. A protective device such as a safety edge and light beam device shall be provided on car door and when activated will prevent closing of doors. Cars shall become available for assignment at whatever floor the last car demand has been satisfied in the direction in which the car is traveling.

#### 2.16.2.3 Car Dispatch

When car does not receive a demand dispatch at dispatching floor for an adjustable time period up to 10 minutes set initially at 5 minutes, the motor drive unit shall be switched-off. If the car's switched-off motor drive unit receives a demand dispatch the motor drive unit shall automatically restart.

#### 2.16.2.4 Door Dwell-Time

Door open dwell-times shall be adjustable so that the open time for a car call is shorter than the open time for corridor calls and second passengers. If a longer time is needed for passenger entry, doors can be prevented from closing or reversing by the light beam door control, the

protective leading edge on car door, or by pressing "DOOR OPEN" button in car. Door dwell-times shall comply with FED-STD 795 and 36 CFR 1191.

- 2.16.3 Omitted
- 2.16.4 Omitted
- 2.16.5 Omitted
- 2.16.6 Omitted

#### 2.16.7 Automatic Power Shutdown

Elevator control system shall cause automatic power shutdown of the elevators in the event that a heat detector or sprinkler head located in the elevator machine room or in the elevator hoistway activates. Heat detector shall be fixed-temperature-rate-of-rise type, rated at 57 to 60 degrees C (135 to 140 degrees F). Activation of a heat detector or a waterflow switch, which monitors only the sprinkler heads in elevator machine room and in the hoistway, shall cause the following operations to the affected elevators:

- a. Elevators which are in motion will proceed to the nearest available landing away from fire floor, and shall cause power-operated doors to open and remain open. The fire floor is considered the floor where the fused sprinkler head or heat detector is located.
- b. Elevators which are standing at a landing with open doors will remain open at the floor. If power-operated doors are closed, the elevator will cause doors to open.
- c. Power to the elevators will be automatically shutdown by operating the shunt-trip breaker(s) in the main line power supply. Shutdown will occur only after the elevators are stopped at a landing, and power-operated doors are opened.
- d. Automatic shutdown will override Phase I Emergency Recall Operations, ASME A17.1, Rules 211.3a and 211.3b, but will not override Phase II Emergency In-Car Operation, ASME A17.1, Rule 211.3c if Phase II operation is in effect.

#### 2.17 OMITTED

#### 2.18 SENSOR AND CONTROL WIRE SURGE PROTECTION

Digital and analog inputs shall be protected against surges induced on control and sensor wiring. Digital and analog outputs shall be protected against surges induced on control and sensor wiring installed outdoors. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following waveforms:

- a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An eight microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

#### 2.19 COMMUNICATIONS LINKS SURGE PROTECTION

Communications equipment shall be protected against surges induced on any communications link. Cables and conductors, except fiber optics, which serve as communications links from Motor Control Room (MCR) to field equipment, and between field equipments shall have surge protection circuits installed at each end. Protection shall be furnished at equipment and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within 1 m of the building cable entrance. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

- a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An eight microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

## 2.20 COMMUNICATIONS LINKS OVER VOLTAGE PROTECTION

Communications equipment such as MODEMS, line drivers, and repeaters shall be protected against overvoltage on any communications link conductors. Cables and conductors, which serve as communications links, except fiber optics, shall have overvoltage protection for voltages up to 480 Vac rms, 60 Hz installed. Instrument fuses or fusible resistors are required for this application.

## 2.21 FIREFIGHTERS SERVICE

Firefighter service shall be in accordance with ASME A17.1 for automatic elevators. Smoke detectors shall be powered from the building fire alarm control panel. Elevator lobby and machine room smoke detectors shall be in accordance with Section 13851 FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE.

## 2.22 ELEVATOR POWER UNIT

### 2.22.1 Pumping and Control Mechanism

Hydraulic fluid shall be provided in the reservoir, pump and control valve.

Hydraulic fluid shall have a minimum fire point of 190 degrees C (375 degrees F) as established by ASTM D 92. If oil temperature drops below pre-set minimum, elevator shall be dispatched automatically to lowest terminal floor at which point the pump will bypass oil in system without car motion until pre-set temperature is reached. Normal response to passenger demand shall not be affected by this control. Resistance type heating elements do not meet the intent of this specification.

#### 2.22.1.1 Oil Temperature Device

An oil temperature device shall be provided that will maintain oil temperature between 21 degrees C (70 degrees F) and 38 degrees C (100 degrees F) regardless of ambient temperatures.

#### 2.22.1.2 Pump

Pump shall be a rotary-positive displacement type for oil-hydraulic elevator service designed for steady discharge with minimum pulsation to give smooth and quiet operation, with an output which will not vary more

than 10 percent between no-load and full-load on the elevator. Operating pressure shall not exceed 2760 kPa (400 psi).

#### 2.22.1.3 Piping

Piping shall be ASTM A 53 Grade E or S, ASTM A 106 Grade B, or grooved piping system of minimum schedule 40 seamless steel conforming to ASME A17.1 and ASME B16.11. Pipes shall conform to the cleanliness requirements of ASME B31.1.

#### 2.22.1.4 Motor

Motor shall be especially designed for oil-hydraulic elevator service and shall be of standard manufacture duty rating and provided with specified speeds and loads.

#### 2.22.1.5 Oil-Control Unit

Oil-control unit shall contain the following valve assemblies:

- a. Automatic shut-off valve shall be provided in the oil-supply line as close to the cylinder inlet as possible. When there is a 10 percent drop in NO-LOAD operating pressure, the automatic shut-off valve shall be activated. When activated, the device shall immediately stop the descent of elevator and hold the elevator until it is lowered by use of the maximum lowering feature of the valve. Manual lowering feature of automatic shut-off valve shall be arranged to limit the maximum descending speed of elevator to 0.08 m/s (15 feet per minute). Exposed adjustments of automatic shut-off shall have the means of adjustment sealed after being set to the correct position.
- b. Relief-valve for hydraulic shall be externally adjustable and shall bypass the total oil flow without increasing back pressure by more than 56 percent above working pressure.
- c. Safety check-valve shall close quietly without permitting any perceptible reverse flow and shall be designed to support the elevator on a positively locked column of oil when car is at rest.
- d. Up-start and stop valve shall be externally adjustable and shall bypass oil flow during the start-and-stop of motor-pump assembly. Valve shall close slowly, gradually diverting oil to the jack unit to insure smooth up-start and up-step.
- e. Lowering and leveling valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed to insure smooth down-starts and stops. Leveling valve shall be designed to level the car to floor in the direction the car is traveling when slowdown is initiated.
- f. Manual lowering valve shall be capable of lowering the elevator car in event of power failure. Manual-lowering valve shall be arranged to limit the maximum descending speed under manual operation to 0.08 m/s (15 fpm).
- g. A service check-valve shall be installed in oil supply line between power unit and jack.



#### 2.22.1.6 Storage Tank

Storage tank shall be single-wall construction of steel with a steel cover. Manufacturer's recommendation for the type of oil to be used shall be included in written instructions for the care, adjustment and maintenance of equipment.

#### 2.22.1.7 Controller

Electric controller shall be of the microprocessor based logic type with battery backup provided with reduced voltage starting. Components required for proper elevator performance shall be neatly mounted and wired and completely enclosed in a cabinet with a mechanically-latched door. Control cabinet shall be designed for mounting on power unit, wall or floor stand. Electric control apparatus shall be completely isolated from oil reservoir.

A feature shall be incorporated in electrical control circuit which will cause elevator car to descent automatically to the lowest terminal landing, if the system runs low on oil during ascending of the car. If power-operated doors are used, the car and hoistway doors shall automatically open when car reaches landing to allow passengers to exit. Parked car shall have doors in closed position and all control buttons shall be made inoperative.

#### 2.22.2 Sound Reduction

Sound-insulating panels shall isolate airborne noise from motor pump assembly. Openings shall be provided to adequately ventilate the power unit motor. A minimum of two sound-isolating couplings shall be installed in oil line in machine room between pump and jack. Couplings shall be designed and manufactured to be blowout proof. Oil-hydraulic silencer shall be installed in oil line near power unit and shall contain pulsation absorbing material surrounded by a blowout-proof housing. Power unit assembly shall be mounted on vibration pads to isolate the unit from building structure.

#### 2.23 LEVELING DEVICE

Elevators shall be equipped with a 2-way leveling device to automatically bring the car to floor landings. Car shall automatically re-level at each landing to correct the overtravel and undertravel, and maintain the level regardless of load on car. Electric stopping system shall be arranged so that the car will stop level with the floor before brake is set. Stopping accuracy shall not exceed a plus or minus 6 mm.

#### 2.24 JACK UNIT

Jack unit shall be designed and constructed of sufficient size to lift the gross load to the height specified and shall be free from oil leakage. Brittle material such as grey cast iron shall not be used in jack construction. Jack unit shall consist of the following:

- a. Telescoping plunger fabricated of heavy seamless steel tubing accurately turned and polished.
- b. Stop-ring welded or screwed to the plunger to positively prevent plunger from leaving the cylinder.
- c. Internal guide bearing.

- d. Packing or seal.
- e. Drip ring around cylinder top.
- f. Outer cylinder made of steel tubing.
- g. Air bleeder.
- h. Brackets welded to jack cylinder for supporting the elevator on pit channels.
- i. Scavenger pump with copper tubing connected to the tank.

#### 2.25 ELEVATOR SUPPORTS

Structural steel beams, inserts, brackets, bolts and fastening devices shall be provided for proper installation of elevator equipment. Wood plugs are not acceptable.

#### 2.26 BUFFERS

Buffers shall be of design suitable for depth of pit. Buffer anchorage at pit floors shall be provided for each car and counterweight and arranged to avoid puncturing the pit waterproofing. Type of buffer used shall be tested and approved for compliance with elevator service requirements before installation. Pipe struts and steadiers shall be provided as required for pit conditions. A metal plate with information concerning stroke and load-rating shall be permanently fastened to each buffer. Pit-mounted buffers shall have an adequate stroke designed to bring the fully-loaded car and counterweight to rest from governor tripping speed at an average rate of retardation not exceeding gravity. Moving portion of buffer shall be designed to be accelerated by the car without noticeable peak retardation. Spring buffers shall be in accordance with ASME A17.1 A17.1.

#### 2.27 LUBRICATION POINTS

Every part subject to movement friction shall be provided with provisions for oil or grease lubrication. All points of lubrication shall be readily accessible.

#### 2.28 SEISMIC REQUIREMENTS

Seismic protection shall be provided to conform to ASME A17.1, Rule XXIV.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Elevators and equipment shall be installed in accordance with ASME A17.1 and manufacturer's recommendation. Guide rails shall be set plumb and parallel and attached to guide rail brackets secured to building structure as indicated and at intervals not exceeding 4000 mm. Steel shim plates shall be used for aligning equipment. Guide rail sections shall be joined together in accordance with ASME A17.1. Guide rails shall be thoroughly cleaned and made smooth before elevator is put into operation. During installation all stainless steel shall be protected.

#### 3.2 FIELD WELDING

When structural or load-bearing members are to be field welded, welding and qualification of welders shall be as specified in Section 05055 WELDING, STRUCTURAL.

### 3.3 CASING, CYLINDER AND PLUNGER UNIT

A steel casing minimum 200 mm larger in diameter than the cylinder sealed at bottom with steel plate or concrete plug shall be complete with provisions to accommodate a single wall or double wall cylinder. Casing shall be accurately positioned, plumbed and set to accept the cylinder. The cylinder shall be protected from corrosion by totally enclosing the cylinder with a separate schedule 80, polyvinyl chloride jacket or with a high density, fused polyethylene coating, recommended by the manufacturer. Area between casing and cylinder wall shall be filled with washed dry sand after cylinder has been accurately located. Top of casing shall be sealed. The work of boring the well and setting the cylinder shall be coordinated with construction of concrete pit.

### 3.4 ELEVATOR WIRING

Wiring shall be provided for electrically-operated items of elevator equipment to comply with requirements of NFPA 70 and Section 16415 ELECTRICAL WORK, INTERIOR. For control and signal circuits wire shall be minimum No. 16 AWG. For power and lighting circuits wire shall be minimum No. 12 AWG. Work light fixtures equipped with 150 watt incandescent lamps and ground duplex receptacles shall be provided at top and bottom of car. Work light fixtures and traveling cable junction boxes shall be located to provide illumination at junction boxes. Wiring shall terminate in junction boxes. Wires shall be identified and shall match symbols shown on wiring diagrams. Control and signal wires shall be brought to accessible numbered terminal blocks on the controller. Intra-panel wiring shall be flame-resistant type.

#### 3.4.1 Traveling Cables

Cables shall terminate at numbered terminal blocks in car and machine room. Traveling cable shall be provided with a separate shielded circuit for communication system and hang to obtain proper size of loop. Traveling cable shall be provided with 10 percent spare conductors for each car.

### 3.5 PAINTING

Except for factory-finished items and corrosion-resistant items, machined surfaces shall be painted as specified in Section 09900 PAINTING, GENERAL.

### 3.6 TESTING

Testing shall be in accordance with requirements of ASME A17.1 and ASME A17.2.2; and as specified below. The Contractor shall conduct a complete test of the system. After the system has passed all tests, the Contractor shall notify the Contracting Officer in writing, 30 days prior to the time of performing the acceptance test, that the system is complete and is ready for final acceptance testing. The Contractor after receiving written approval from the Contracting Officer will conduct a complete acceptance test of the system. The Contractor shall provide the services of an elevator inspector, employed by an independent testing company to inspect the elevators, witness the final testing and certify the elevators. The inspector shall meet all qualification requirements of ASME QEI-1 and shall

be certified in accordance with ASME QEI-1. The Contractor shall provide an elevator certificate signed by the inspector for each elevator. The certificate shall be provided to the Contracting Officer within 30 day after the completion of all testing.

#### 3.6.1 Testing Period

Each elevator shall be tested with the specified rated-load in car continuously for a period of 35 percent of the duty time. During the test run the car shall be stopped at all floors in both directions of travel for a standing period of 10 seconds per floor. A manual test of the final limits (UP and DOWN overtravel) shall also be performed.

#### 3.6.2 Speed Load Testing

The actual speed of elevator car in both directions of travel shall be determined with the rated-load and with no-load in the elevator car. Actual measured speed of car with the rated-load in the UP direction shall be within 5 percent of rated speed. The maximum difference in actual measured speeds obtained under the various conditions outlined shall not exceed 10 percent of the total difference between the UP and DOWN speeds.

#### 3.6.3 Car Leveling Testing

Elevator car-leveling devices shall be tested for accuracy of landing at all floors with no-load in car, with symmetrical load in car and with the rated-load in car in both directions of travel.

#### 3.6.4 Temperature Rise Testing

Temperature rise of hydraulic pump motor, motor drive, exciter and booster shall be conducted during the full-load test run for minimum one hour. Under these conditions, temperature rise of equipment shall not exceed the requirements established in NEMA MG 1 Chapter 12. Test shall be started when all parts of equipment are within the temperature required by NEMA at time of starting tests.

#### 3.6.5 Insulation-Resistance Testing

Insulation-resistance testing shall be performed to ensure that the complete elevator wiring systems will be free from short circuits and grounds. Electrical conductors shall have an insulation-resistance of not less than 1 megohm between each conductor and ground, and not less than 1 megohm between each conductor and all other conductors. Prior to testing, provisions shall be made to prevent damage to electronic devices.

#### 3.7 FRAMED INSTRUCTIONS

Two sets of instructions shall be typed and framed under glass or in laminated plastic, and posted side-by-side in the elevator room where directed before acceptance of elevator systems. First set of instructions shall include wiring and control diagrams showing the complete layout of elevator system. Second set of instructions shall include the condensed operating instructions describing preventive maintenance procedures, the methods for checking the elevator system for normal safe operation, and the procedures for safely starting and stopping the elevator system.

#### 3.8 OPERATOR TRAINING

Contractor shall conduct a formal training course for operating Government personnel which shall include care, lubrication, adjustment and maintenance of elevator equipment. Training period shall consist of a total of 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. Field instructions shall cover all of the items contained in the operating and maintenance instructions, including demonstrations of routine maintenance operations. Contracting Officer shall be notified at least 14 days prior to date of starting the training course.

-- End of Section --